Commissioning Report Executive Summary

OVERALL PROJECT SUMMARY

Based on the OPR workshop conducted by CxGBS with participation by the Department of State and GSA developed the following objectives for the project:

Development of a high-quality museum that will:

- Preserve and protect artifacts, photographs, paintings, and other delicate items
- Facilitate ease of access to perform maintenance and operational tasks
- Cost less to operate
- Provide excellent indoor environmental quality for visitors and staff
- Minimize utility usage and environmental impacts
- Provide exceptional visual acuity for all visual tasks under a variety of weather conditions to facilitate staff and visitor's interactions with the museum different displays and interactive exhibits

From an educational perspective, DOS's goals are also to:

- Promote better understanding of U.S. diplomacy and the Department of State's work
- Reveal how U.S. diplomacy has shaped our nation's history
- Honor the service and sacrifice of U.S. diplomats, past and present
- Illustrate how U.S. diplomacy impacts people's daily lives
- Demonstrate the ways in which U.S. diplomats assist Americans overseas
- Build a national constituency for U.S. diplomacy and the Department of State
- Inspire people, particularly students, to follow careers in diplomacy
- Emphasize the roles people can assume as effective citizen diplomats

The project completed the building portion of Phase 1 of the U. S. Diplomacy Center (USDC) Museum. Completion of Phase 1 is expected to occur within a couple of years when the exhibits are constructed and installed. Two additional phases and planned converting existing space within the Harry S. Truman Building into additional museum space in the future.

The USDA project included design of approximately 41,400 square feet of space adjacent to and within the State Department's Harry S. Truman Building and George C. Marshall Wing and the construction of the 1st Phase which included the Pavilion Portion of the project, approximately 23,600 square feet, located near the 21th Street Marshal Wing Entrance in Washington, DC.

- Owner: General Services Administration
- Using Agency: United States Department of State

United States Diplomacy Center
Owner's Project Requirements

Prepared for

General Services Administration

January 12, 2012

Serving the Life of Your Building
Commissioning & Green Building Solutions, Inc.

Executive Summary:

The OPR is a document that establishes the goals for The United States Diplomacy Center (USDC). By establishing the goals for the USDC in a single document, the OPR becomes a record by which the United States Department of State (DOS) and the General Services Administration (GSA) can judge the success of the project in meeting their requirements and criteria. This document conveys CxGBS's understanding of the project requirements and is presented as a draft for GSA and DOS to review and comment on. The draft will be modified based on comments received.

The USDC will be a 42,500 square foot space adjacent to and within the State Department's Harry S. Truman Building George C. Marshall Wing. The space will be constructed for DOS. A welcoming and security pavilion within the existing forecourt will mark the building's 21st Street Entrance, and a restored historic lobby and new exhibition spaces will complete the interior first floor renovation. The exhibits within the museum will use interactive technology and compelling artifacts, the exhibition spaces will host immersive exhibits and theater presentations that foster an engaging environment in which the public can learn about the complexity and importance of American diplomacy. The USDC will be a place to welcome visitors and showcase the Department's activities around the world. General needs as well as specific needs for the facility are provided in this OPR. These needs were established based on information identified in the OPR workshop which indicated occupant and owner needs regarding facility functions, human comfort, energy efficiency, etc.

GSA and DOS recognize the importance of complying with Executive Order (E.O.) 13514; Federal Leadership in Environmental, Energy, and Economic Performance. Therefore, the facility will be designed to use long lasting and low maintenance materials and to exceed requirements set forth by ASHRAE Standard 90.1-2007 by 18% or more.

In summary, GSA is seeking a facility that will serve the visitor and administration needs. The goals for the use of the USDC incorporate the current needs and requirements of the USDC's visitors, staff, and owner, as well as flexibility in recognition that their needs will likely change over time. Finally, the ultimate goal for the project is to construct an efficient facility that will communicate the history and mission of the United States State Department to visitors and provide the attributes staff need to efficiently and effectively execute their mission while also meeting Federal Leadership in Environmental, Energy, and Economic Performance to reduce environmental impact, operating and maintenance cost.

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United States Diplomacy Center – OPR

Overview

The Owner's Project Requirements (OPR) document communicates the USDC, State Department, and GSA requirements that form a basis from which all design, construction, acceptance, and operational decisions are made. As decisions are made during the Design, Construction, and Occupancy and Operations Phases, this document will be updated to reflect the current project requirements of the Owner. It is the primary tool for benchmarking success and quality at all phases of the project delivery and throughout the life of the facility. Commissioning & Green Building Solutions (CxGBS®) will maintain the OPR for the owner and modify it as directed by USDC, GSA and DOS.

Owner's Project and Performance Requirements: General

Objectives and Functional Requirements

Objectives

GSA's objective is to develop a high quality museum that will:

- Preserve and protect artifacts, photographs, paintings, and other delicate items
- Facilitates ease of access to perform maintenance and operational tasks
- Cost less to operate
- Provide excellent indoor environmental quality for visitors and staff
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Project Schedule

The project is divided into two phases, Phase I and Phase II. Phase I is the new construction of the Entry Pavilion facing 21st street. This phase is scheduled to complete at the beginning of 2013. Phase II will encompass the renovation of Halls II and III in the existing George C. Marshall wing of the Department of State Harry S. Truman Building. This phase does not yet have a scheduled completion date, though it is estimated that Phase II may not begin until 2014 or later. Table 1 outlines the current project schedule.

Table 1: Project Schedule for Phase I

Date	Event Description
September 2011 – January 2012	Design Development
January 2012 – February 2012	Design Development Review
February 2012 – March 2012	Bid Documents
March 2012 – April 2012	Bid Document Review
April 2012 – June 2012	Bid Phase
January 2013	Construction Phase Complete

User Requirements

Several documents are required for USDC staff to properly maintain the facility. These documents include: O&M manuals, as-built drawings and a Systems Manual. Documentation will be tailored to the specific components that are installed in the facility. Documentation shall include two (2) copies of operation and maintenance documents in approved electronic file format and one (1) hard copy. The general documentation requirements for USDC are as follows:

- O&M manuals will provide the information needed to understand, operate, and maintain the systems and/or assemblies in the building. The manuals shall be reviewed for completeness prior to delivery to USDC, DOS, and GSA. The O & M manuals will be submitted to the designer to review for completeness and provide direction to the contractors regarding additional information required. Copies of the O&M manuals will also be submitted to CxGBS, concurrently with the designers, for review and comment. CxGBS shall provide comments to the design team and copy USDC, DOS, and GSA.
- As-Built drawings will accurately depict location of building components illustrated in the drawings and modifications that are different than the bid documents. As-build drawings shall be legible and clearly communicate the variations different than the bid documents. Maintain and submit two sets of Bid Document and As-Built drawings. Include a cross reference on the Contract documents to identify that a modification has occurred. Identify

and date each record drawing. Record and check markups before enclosing concealed installations.

- The Systems Manual shall provide information not contained in the O & M manuals and provide the criteria provided to the designers of the USDC museum. The System Manual shall also provide the designer's basis of design containing the design team's assumptions, calculations, decisions, and product selections used to meet the Owner's Project Requirements and to satisfy applicable regulatory requirements, standards, and guidelines. The document includes both narrative descriptions and lists of individual items that support the design process and the selection and design of building systems and assemblies. The Systems Manual is the repository of operational information, maintained by the operational staff, regarding modifications to the building operation and the reasoning for the modifications are recorded. The Systems Manual shall contain a copy of the commissioning report containing information gathered during the Commissioning Process. The manual shall also contain training documents and video disks, discussed in more detail in the 'Training Requirements for Owner's Personnel' section of this document.

  In order to complete the Systems Manual, CxGBS must be provided with the following:

Table 2: Systems Manual Documentation Responsibility Matrix

Responsible Party	**Document**
Design Manager	Basis of Design
Design Manager	Design Narrative
Contractor	Provide system diagrams that illustrate each major mechanical, electrical, plumbing, information technology, and security system separately. Each system drawing shall show the entire system with key components legibly depicted in a fashion that allows operators to fully understand the system configuration, components that affect its operation and the location of those components in the system. Each drawing shall include narratives that describe the operation of the system and its components sufficient to troubleshoot system problems. Control documentation shall include complete as-built control drawings with points list, valve schedules, schematics, control system architecture and final sequences of operation for all components.
Professional Design Team	Single line drawing for the water and air side of the complete HVAC system
Design Manager	Final training video(s)

ME – Mechanical Engineer EE – Electrical Engineer CC – Controls Contractor

Training Requirements for Owner's Personnel

The Training provided to the operations and maintenance personnel and staff will educate them on operation and maintenance of building systems and assemblies installed in the facility, as well as cleaning of the building.

Training is a progressive, on-going process, which will occur during construction, after substantial completion, and prior to final completion. During construction, training shall orient facility operations and information technology staff with the facilities infrastructure including location of data ports in the ceilings, valves, and equipment during construction. Training occurring after substantial completion of the exhibits will consist of training for building and exhibit cleaning, MEP systems, IT systems, PDAs, monitors, and other audio/visual elements. Training will include classroom and hands-on sessions, which may include the use of overhead projection, slides, and training videos from equipment manufacturers. Training will be witnessed and documented by the commissioning authority. The contractors, designers, DOS, USDC, and GSA will develop and execute the training program.

Training occurring after substantial completion shall be video recorded to allow for future training of new personnel. Video training will be edited so that cleaning and maintenance staff can quickly find available information. For all training except cleaning, it shall be broken down by system, following the basic outline provided in Appendix B. For cleaning training, it shall be broken down as indicated in Appendix C.

It is expected that USDC personnel will perform almost all of the operation of, service to, and repair of the equipment. Training for mechanical, electrical and plumbing (MEP) building systems (See Table 7 for specific systems included) will be completed by both designers and contractors, and will be provided to DOS mechanical and electrical staff, and USDC personnel. The designer will be responsible for discussing the intent and purpose of the design of the systems (as indicated in the Basis of Design) to the trainees, while the contractor will discuss more specific details regarding each system or piece of equipment (see training outlines below).

MEP training will address the following (as is applicable):

- Overview of System
- General purpose of the system or equipment
- Relevant health and safety issues, concerns, and special safety features (if applicable)
- Review of control drawings and schematics (if applicable)
- System Controls
- Interactions with other systems, operation during power outage and fire (if applicable)
- Energy efficient operation and strategies (if applicable)
- Service, maintenance and preventative maintenance (sources, spare parts inventory, special tools, etc.) (if applicable)
- Special requirements of tenants for this equipment's function (if applicable)
- Common troubleshooting issues and methods, control system warnings and error messages, including using the control system for diagnostics (if applicable)
- Operators requirements to maintain warranty (if applicable)
- Question and Answer Session

Training for IT systems, PDAs, monitors, and other audio/visual elements in the museum will require training from IT professionals familiar with the equipment in the building. This training will be completed after installation of all IT and A/V equipment, and will cover programming, troubleshooting, normal operation as well as operation during and after power outages and/or emergencies, system warnings, preventative maintenance, service, warranty, safety concerns, and other information necessary to repair and operate the equipment.

Janitorial and cleaning training shall occur after the building has been completed and before occupancy. The custodial staff for the USDC will consist of either the existing custodial staff in the Harry S. Truman building, or new staff hired on specifically for the USDC (at the discretion of the owner). Museum specialist cleaning staff shall be hired for cleaning of exhibits, and basic custodial staff, existing or new, shall be responsible for cleaning of the rest of the USDC. Museum specialist cleaning staff shall be educated on the proper cleaning of several items including, but not limited to, exhibits and artifacts, exhibit finish materials, and Plexiglas. Basic custodial staff shall be educated on the proper cleaning of base building finish materials, monitors, entry pavilion glass roof and walls, restrooms, and other areas/items museum specialist cleaning staff is not responsible for including light bulb replacement.

Training regarding emergency protocol, communication protocol, hospitality orientation, exhibit display and purpose, programs offered, after hours event scheduling, etc., will be given to USDC staff by USDC.

It is not typically expected that the trainees will have memorized everything from the training session, but it is expected that they know where the information is, can find it, and understand sufficiently how to walk through the key steps to troubleshoot a problem and resolve it. Documentation, written instruction, videos, and other documentation discussed during training sessions will be included in the Systems Manual documentation in the building for future reference. The staff member responsible for the O&M staff shall determine an appropriate location for the O&M Manual. Once a location has been determined, he/she shall inform O&M staff of the location, and shall also update the "Key Building Document Locations" page in the Systems Manual with this information. For new facility staff, training will consist of the review of as-built drawings to provide orientation of facility infrastructure, review of System's Manual and its contents, and review of relevant video training.

Warranty Requirements

General warranty periods are provided by manufacturers for building materials and systems, and are typically for a period of one year after final completion. However, some specific systems have longer warranty periods. Final completion shall be determined by the construction administrator for GSA. A representative list of systems typically featuring a longer than one year warranty is as follows:

- Roofing: 20 years for Leakage and Weather and 30 years for paint
- Windows: 10 years for trim and glass
- Sealants: 20 years
- HVAC Compressors: 5 years
- Water Heaters: 5 years

Benchmarking Requirements

Benchmarking requirements provide a means where the facility design and construction are measured and judged with respect to standard practices and industry standards. Benchmarking requirements form the fundamental basis for the design and construction of the facility. The benchmarking requirements are evaluated based upon the following criteria:

- Visitor retention (i.e. repeat visitors) equal to or greater than visitor retention in museums in the area of the same size
- No moisture intrusion through fenestration system – No evidence of water intrusion when tested utilizing procedures similar to AAMA 501.2 procedures
- Little or no occupant complaints – the number of occupant complaints tracked by type, time, and person
- Durability – systems and materials meet durability requirements (in years of serviceable life) outlined in the 'Quality Requirements of Materials and Construction' section of this document
- Zero security breaches in the entire Harry S. Truman Building
- The entry pavilion shall be at least 18% more efficient than baseline building performance according to ASHRAE 90.1-2007
- Fewer callbacks when compared to similar buildings
- Positive critical reviews and publicity
- Phase I of the project is completed and self-sufficient by January 2013.
- Zero damage to exhibits and artifacts due to building operation, (i.e. humidity, temperature, etc.) building maintenance, and building cleaning.
- More visitors when compared to other museums in the area of the same size
- No moisture intrusion due to negative pressurization – Pressure mapping indicates interior spaces are positively pressurized relative to outside by > 5 Pascal
- Achieve LEED Silver certification for Phases I and II of the project
- System down time – the number of hours per year system does not operate as required < 1%
- No change orders during construction attributed to insufficient design information or design errors
- Space temperature and humidity conditions are maintained within desired setpoints (as indicated in the 'Allowable Tolerance in Facility System Operations' section of this document)
- Reduced employee sick days or employee absenteeism when compared to national average
- No condensation on ceiling glazing surfaces
- Daylighting controls are utilized and function correctly in the USDC
- Warranty issues – no warranty issues occur during the first 5 years of operation

Operation and Maintenance Criteria

Operation and Maintenance is a team effort involving O&M staff, designers, contractors, and USDC staff members. To help ensure proper functioning of the facility, the operation and maintenance criteria shall be adhered as follows:

- Lead operations and maintenance personnel will have between 10 and 25 years of experience and it is assumed they are proficient in basic maintenance techniques
- Designers are to ensure sufficient access and clearances that do not restrict operator movement while performing maintenance tasks. Tasks include, but are not limited to, removal and/or replacement of major components, and routine maintenance. Tasks shall not require displacement or endangerment of artifacts or exhibits.
- Contractors shall coordinate installation of building materials and components, including exhibits and displays, to allow ease of maintenance without deconstruction or limited range of motion for maintenance staff
- Operations and maintenance personnel will monitor the condition of equipment in order to perform reliability centered maintenance. Reliability centered maintenance is defined as examining and testing the current condition of equipment before determining what, if any, maintenance will be undertaken while taking into account that it is more cost-effective to repair and replace inexpensive or unimportant parts only as needed.

Equipment and System Maintainability Expectations

Maintainability of building systems and equipment is important to the owner. Maintenance and replacement costs must be considered over the life of the facility and selections of materials will be based on minimizing life cycle costs. Life cycle cost analysis shall be in accordance with Federal Energy Management Program Handbook 135 including its annual supplement. Design of mechanical, electrical, and plumbing systems shall allow for operation and maintenance as outlined in the 'Operation and Maintenance Criteria' section of this document. Access to the building exterior shall allow for easy cleaning, maintenance, repair, and replacement of building exterior components including windows, gutters, and sealants.

Systems and building components shall have a long serviceable life, as follows:

- Mechanical systems - 30 years
- Piping and plumbing infrastructure - 75 years
- Lighting systems - 20 years
- HVAC ductwork, diffusers, grilles and registers - 30 years
- HVAC components (i.e. VAV's, dampers, coils, and compressors - 20 years
- Electrical systems - 35 years
- Exterior sealants – 20 years
- Hard surface flooring – 50 years

Electrical systems will allow replacement of lamps, fixtures, electrical switch and panel boards, conductors and other electrical products as advancements in technology become available.

Equipment shall be equipped with hinged inner and outer covers rather than bolted covers.

Quality Requirements of Materials and Construction

The pavilion shall be designed to serve and resist long term degradation from nature. Thus, selection for architectural and structural systems and materials must be based on the ability to provide years of service with minimum maintenance and to withstand typical weather conditions that have occurred in this region. The Design Team will address design criteria that include moisture intrusion and snow/ice and freeze thaw conditions.

Allowable Tolerance in Facility System Operations

- The space temperature and relative humidity conditions throughout the USDC will be closely monitored and controlled in order to avoid the potential of damage to exhibits or condensation on the Entry Pavilion's glass enclosure. Throughout most of the year, the interior temperature must be kept between 70 and 75 degrees Fahrenheit and the relative humidity must be kept at 50%. Relative humidity in the entry pavilion may need to be lowered during the colder months in order to prevent condensation (as discussed above). There will be no unoccupied temperature set back allowed in the building.
- AV and IT room must be conditioned by independent Computer Room Air Conditioning (CRAC) Units so as to maintain strict temperature, humidity, and air change requirements. This room must maintain, at all times (24 hours per day, 365 days per year) a temperature between 64°F and 75°F with a relative humidity of 30% to 55%. The rooms must have a minimum of two (2) complete changes of air per hour.
- Interior spaces positively pressurized relative to exterior by > 5 Pascal

Energy Efficiency and Environmental Sustainability Goals

The pavilion shall be designed to be at least 18% more efficient than baseline building performance according to ASHRAE 90.1-2007 requirements. The building envelope shall minimize discomfort to occupants related to radiant (surface temperatures) effect associated with feeling of hot or cold radiated from the interior surfaces of the exterior envelope.

Health, Hygiene, and Indoor Environment Requirements

Creating a building with good indoor environmental quality requires the coordination of several design parameters, construction and using agency activities, and surrounding environment conditions and activities. These include, but are not limited to, ventilation rates, materials used to construct the facility, installation sequence, location of makeup air intakes, external and internal pollutant generation, humidity, temperature, and other parameters that may affect occupant's perception negatively.

The following are measures which must be taken to prevent pollutants from entering the building, based upon known sources of pollutants in/near the facility that can impact the health, hygiene, and indoor environmental quality of occupants:

- Whenever possible, non-toxic caulks, paints, coatings, adhesives, sealants and cleaning products shall be used. Materials shall be carefully selected for their low or no VOC content.

- There is no smoking allowed in the building at any time. Smoking will only be allowed outside of the building.
- Procedures during construction shall be implemented by the contractors to minimize construction-related contaminants in the building. These procedures include activities such as regular space-cleaning activities, protection of delivered equipment and materials before and after material/equipment installation.
- Building pressurization shall be regulated to prevent construction related contaminants in the pavilion from entering the exiting building. During construction, the pavilion area pressure shall be negative with respect to the existing building but positive relative to the outside.
- Absorptive building materials will be stored in a weather tight, clean area prior to unpacking for installation and protected during and after installation.
- Accumulation of water during construction must be avoided and any porous construction materials such as insulation must be protected from moisture.
- Dust in the construction area will be suppressed with wetting agents or sweeping compounds. Project shall have a construction indoor air quality plan that defines how moisture and construction related debris will be controlled to protect the construction workers, occupants in the Harry S Truman Building, and future occupants of the USDC museum.
- Finishes, paints, adhesives, coatings and sealants that emit harmful chemicals or odors during curing shall be scheduled to minimize absorption by absorbent materials include ceiling tiles, carpets, insulation, gypsum products, and fabric covered furnishings.
- The facility shall be positively pressurized with careful consideration of locations of outside air intakes. Outside air intakes should located in areas that are not:
    - Accessible to the general public
    - Located near ground level where pesticides or other harmful chemicals may be applied
    - Located near exhaust from generators, vehicle traffic, and/or other sources of pollutants
- HVAC system duct work and mechanical equipment shall be protected during construction period operation to prevent acumination of construction generated duct from entering or building up within the HVAC system components.
- Prior to test and balance the filters protecting the HVAC system shall be replaced. No construction generated particulate shall be generated in areas after the start of testing and balancing.
- Café shall be equipped with a triple sink, as coffee will be served in this area.
- The café seating area shall be designed to allow for complete removal of food and waste debris generated in the areas
- HVAC equipment and return air ducts prior to startup shall be protected by correctly installed and maintained plastic membrane over all openings. HVAC equipment operated during construction shall be protected prior to startup with properly installed and maintained filters

having a minimum MERV rating of 8, at both the equipment and return air openings of the operated equipment. Filters shall continue to be maintained while construction generated particulate is being generated. Construction filters shall be replaced with filters meeting or exceeding MERV rating of 13.

Seismic Requirements

Comply with local code requirements.

Accessibility Requirements

The building will be designed to meet all ADA requirements. Systems requiring routine maintenance shall be designed to meet criteria outlined in the 'Operation and Maintenance Criteria' section of this document.

Security Requirements

The security screening system for visitors and staff will be a smoothly run process. The new Entry Pavilion will serve as the primary entrance for a variety of building users that will require varying degrees of screening and screening equipment, during varying hours of access to the building by building users and visitors. Table 3 indicates the screening requirements which will be necessary for different visitors and staff at the USDC.

Table 3: Screening Requirements

Time	Type of pedestrian	Processes
0000-1000	DOS Staff/Badge Holder	- Visual inspection by Security Officer to right of entry. - Proceeds up right ramp to existing Historic Lobby for further validation at dual verification turnstile.
	DOS Visitor	- Full screening with X-Ray and Magnetometer to right of entry. - Proceed to existing Historic Lobby for check-in at reception desk.
	USDC Visitor	- Not allowed to enter at this time.
	Marshall Conference Center Visitor	- Full screening with X-Ray and Magnetometer to left of entry. (Screening should take place at the USDC screening check point, to the left of entry to avoid conflict with DOS Staff/Badge Holders) - Proceed to existing Historic Lobby for check-in.
	Group/Bus Tours	- Not allowed to enter at this time.
1000-1700	DOS Staff/Badge Holder	- Optical Turnstile with barrier, contact card reader, dual authentication. - Proceeds to existing Historic Lobby for further validation by dual verification turnstiles.
	DOS Visitor	- Full screening with X-Ray and Magnetometer to right of entry. - VIP Visitor - Security Officer should have prior knowledge of VIP and have secondary screening station prepared to right of entry to fully screen VIP visitor who will then proceed to Historic Lobby for check in.
	USDC Visitor	- Proceed through primary screening to left of entry through full X-Ray and Magnetometer screening.
	Marshall Conference Center Visitor	- Full screening with X-Ray and Magnetometer. (Screening should take place at the USDC screening check point to the left of entry to avoid conflict with DOS Staff/Badge Holders). - Proceed to existing Historic Lobby for check-in.
	Group/Bus Tours	- Full screening with X-Ray and Magnetometer to left of entry. (USDC anticipates only one bus a day – if more than one large group arrives on a given day, cuing for screening will be tight).
1700-1000	DOS Staff/Badge Holder	- Visual inspection by Security Officer - Proceeds to existing Historic Lobby for further validation at existing dual verification turnstiles.
	DOS Visitor	- Full screening with X-Ray and Magnetometer to right of entry.
		- Proceed to existing Historic Lobby for check-in
	USDC Visitor	- Not allowed to enter
	Marshall Conference Center Visitor	- Full screening with X-Ray and Magnetometer. (Screening should take place at the USDC screening check point to left of entry to avoid conflict with DOS Staff/Badge Holders). - Proceed to existing Historic Lobby for check-in.
	Group/Bus Tours	- Not allowed to enter

For the entire building, the electronic security system design elements will consist of access control, intrusion detection, video assessment and surveillance, and detection and screening. New electronic security devices will be installed as part of this project. All new systems must be compatible with the existing base building system.

Egress for Doors - Exit doors shall be designated for emergency egress only. Exit doors shall be equipped with recessed door contacts and local audible alarms. Dedicated emergency generator power circuits shall be provided at each door to energize exit alarm control panels.

Fire Protection Systems Integration - The power supply units for electronic, electromechanical, and electromagnetic locking devices shall contain a dedicated relay that is integrated with the fire alarm control panel (FACP). Fire alarm, sprinkler, or fire detection system activation shall initiate a signal from the FACP to the door lock power supplies. The signal shall cause the fire relay to open providing a mechanical break in door lock power.

Intrusion Detection System - The USDC's Intrusion Detection System (IDS) will be designed to protect the perimeter, interior, and exhibits within the museum space. The IDS will provide detection and immediate notification of unauthorized access to control spaces. It will be monitored and controlled by the SMS in the Security Operations Center. IDS components will include contacts, motion detectors, glass break sensors, and sounders.

Video Assessment and Surveillance System - The Video Assessment and Surveillance System (VASS) (CCTV System) shall integrate with the existing VASS. Interior cameras will be color cameras in vandal resistance enclosures. CCTV Coverage shall be provided in the following areas: Point surveillance all entry and exits into the entry lobby and exhibit space; General exhibit space; Point surveillance of high value exhibit; General surveillance of the café; and general surveillance public event areas

Exhibit Areas - Provide security conduit and junction boxes to allow for adequate security devices for this area.

PDAs – Visitors will be issued a passport (PDA) upon entering the museum. It is understood that PDA's may break, or could possibly be stolen. In an effort to reduce the risk of theft of the PDAs, a method of security for these devices will need to be determined. Although one option will be selected by the owner, several possible options have been discussed, as indicated below:

- PDA shall have an alarm tied to it, which will go off if a PDA is taken out of the building
- PDA shall be proximity restricted (it will not function if taken outside of the building)
- Visitors and staff shall be screened by security before exiting the building

Communication Equipment Rooms (CER) - An existing CER will serve as Electronic Security Equipment Room for the Museum.

- Security Wall Mounted Equipment - Security equipment including control panels, input/output modules, power supplies, and dedicated emergency generator power shall be provided in the CER.
- Conduit Systems - Security data transmission systems will be in a completely dedicated conduit system from the device to the CER.

Necessary quantities of security devices by area of the building are indicated in Table 4.

Table 4: Security Design Matrix

	Entry Lobby	Historic Lobby	Hall 1	Hall 2	Hall 3	Café
Access Control						
Electric Lock	-	-	-	-	-	-
Card Reader	2	-	-	-	-	-
Optical Turnstile	2	-	-	-	-	-
Intrusion Detection						
Contacts	10	-	10	20	30	-
Motion Detectors	4	-	4	10	10	2
Seismic Sensors	-	-	10	20	30	-
Glass Break Sensors	10	-	6	10	10	-
Sounders	4	-	-	2	2	-
Video Assessment and Surveillance						
Fixed Camera – Specific	4	4	2	6	10	2
Fixed Camera – General	-	-	4	4	10	2
PTZ	2	-	2	2	4	1
Detection and Screening						
Magnetometer	3	-	-	-	-	-
X-Ray Machine	3	-	-	-	-	-

HVAC Requirements

HVAC Systems shall be designed to allow flexible operational strategies that can adapt to changes in utility rate structures and values including power monitoring and load sharing capability. Mechanical piping systems and air distribution systems shall be designed to minimize frictional loss. The exhaust system shall be designed to adequately ventilate the space and to meet the ASHRAE 62-2007 Ventilation for Acceptable Indoor Air Quality Standard. HVAC systems shall be zoned to meet heating and cooling load requirements for interior and perimeter spaces.

The OPR workshop indicated that the most important things to provide a positive visitor experience, as well as comfort in an ideal building, are the temperature and humidity conditions and controls. The HVAC system shall provide required heating, cooling, and humidity control under varying loads. In order to maintain conditions (i.e. temperature and humidity) acceptable for preservation of artifacts and displays in the museum, the HVAC system will operate as outlined in the 'Allowable Tolerance in Facility System Operations' section of this document. HVAC systems and controls shall be integrated with the existing building automation system (BAS), which shall provide the capability of exporting trending information to a spreadsheet or database. Building pressurization shall meet minimum requirements contained in the 'Allowable Tolerance in Facility System Operations' section of this document.

Electrical Requirements

Electrical systems shall be capable of meeting requirements necessary for museum and business activities throughout the facility. As needed, the facility will be served by the emergency generator in the existing building, and point of use uninterruptible power supply (UPS) systems. Data transmission and communications devices, as well as security equipment, shall be on uninterrupted power supplies that provide continuous power for a minimum of eight hours. Low voltage equipment shall be energized by the emergency power generator. Number of lamp types shall be minimized and access to all light fixtures shall be provided.

Occupancy Requirements and Schedules

USDC team members wish to make the museum open to the public every day, except Christmas, from 10 am to 5 pm. Employees will be able to access the building 24 hours a day, 7 days a week. There will be specific evening events that could consist of dinners, signings, concerts, receptions, etc. These events shall be accommodated for in terms of security, HVAC, lighting, seating, PA system, etc. Storage areas which hold furniture and other equipment which may be used during an event should be easily accessible for movement of items into and out of storage before, during, and after the event. These events shall be scheduled with security and USDC staff via the desired/chosen internal process. During these events, the public will be limited as to how far they may enter into the building (i.e. certain areas will be restricted). This must also be discussed with security and staff when scheduling events.

Community Requirements

None provided

Adaptability for Future Facility Changes and Expansion

Phase II of the USDC project consists of the renovations within the existing George C. Marshall wing of the Harry S. Truman Building. No other future facility changes and expansion are currently scheduled. Exhibit space design and placement shall be flexible to allow for changing of an exhibit and/or its contents. Specific exhibit flexibility requirements are indicated in greater detail in the 'User Requirements for Exhibit Areas' portion of this document.

Acoustical Requirements

Acoustics and noise level in the space are indicated to be the second most important element with respect to comfort in the building. Therefore, it is important that the acoustics and noise levels are acceptable within the museum.

Soundproofing and acoustical treatment will be implemented in the design and construction of several areas within the building. Desired reverberation and STC Ratings must meet or exceed those indicated in Tables 5 and 6.

Table 5: Reverberation times for unoccupied spaces

TYPE OF SPACE	REVERBERATION TIME (seconds)
Entry/Pavilion	.8-1.2
Orientation Theater	.6-.8
Café Seating Area	.4-.6
Museum/Exhibit Hall	.6-.8
Power of Negotiation Theater	.4-.6
Classroom with Video Conferencing	.3-.5

Table 6: STC Ratings

Adjacency		STC
Entry/Pavilion	Orientation Theater	55-60
	Café Seating Area	40-45
	Corridor	45-50
Café Seating Area	Mechanical	55-60
Museum/Exhibit Hall	Power of Peace Theater	50-55
	Electrical / Mechanical	55-60
	Classroom w/ Video Conferencing	55-60
	Corridor	45-50

In each exhibit space, sounds should be loud enough for visitors to hear, and, at the same time, sound/audio shall not interfere with sounds/audio in surrounding exhibit spaces.

Vibration Requirements

The Pavilion shall be designed to prevent museum visitors and staff from sensing vibrations due to structural deflection as a result of occupant traffic or HVAC equipment operation.

Aesthetics Requirements

The interior finishes, displays, and design must be aesthetically pleasing to both visitors and staff. The exterior of the building will be regal and strong, representing the power and prestige of a long established and long standing practice of diplomacy. At the same time, the pavilion will be a warm and welcoming entrance and museum leading into a restored historic lobby and building.

In addition to the design, signage within the building will complement the interior finishes in the building, while clearly indicating to visitors where exhibits, desks, spaces, staff, etc. can be found within the museum. Clear signage and way-finding is an important element in providing a positive visitor experience.

Communication Requirements

None provided

Applicable Codes and Standards

The building should be designed to comply with GSA's Facilities Standards for the Public Buildings Service document P100 (most current version).

Requirements for the USDC

Space for the USDC facility can be grouped into five main sections: The Pavilion Main Level, The Pavilion Lower Level, Historic Lobby, Hall II, and Hall III.

In entrance areas, congregation areas, exhibits, restrooms, meeting areas, etc. within the building, visitor and staff comfort, lighting, and acoustics must be considered. Lighting (both artificial and daylight) must provide for excellent visual acuity while avoiding damage to exhibits or finishes, lighting must not produce glare on monitors or displays, photos, and/or Plexiglas, and uncomfortable direct sunlight should not be directed onto desk or table areas, areas for seating for visitors and staff, and congregation areas. Also in each exhibit, acoustics must be designed as required in Acoustical Requirements section. Individual exhibit requirements are discussed in more detail under "User Requirements for Exhibit Areas."

Entry Pavilion Main Level (Exhibit Hall I)

Both the Upper (Main) and Lower Levels of the Entry Pavilion will house a variety of functions and exhibits to enhance the visitors experience and comfort. Control of the solar load (as discussed in the 'Energy Efficiency and Environmental Sustainability Goals' section of this document), and control of direct sunlight (as discussed in the 'Requirements for the USDC' summary section) in this area is especially important, as the entirety of the building envelope is primarily glass curtainwall.

Entrance – The grand entrance allows the visitor to become acquainted with the space and prepare for security screening. Reception will also be located in the entrance area to help orient visitors. The entrance will consist of sculptural enclosures for two exhibits: a theatre and exhibit walls

Reception – The main reception area will be located directly across from the main entrance. This will allow the visitor to easily ask questions and gain information before traveling further into the museum.

Security – There will be two screening stations to the north of the entry and one screening station to the south of the main entrance. The security area is discussed in more detail in the Security section of this OPR document.

Entry Ramps – The ramps will serve a dual purpose of creating an accessible way to reach the historic entrance and initiating the visitor's exhibit sequence for the museum. The north ramp will be used for the beginning sequence and the exhibits Prologue. The south ramp will be used for the ending sequence of the museum tour and the exhibits Epilogue.

Central Exhibit Space – This area will serve a variety of functions for the museum. The space will not only be used as exhibit space but can also function as flex space for events. Within this space two exhibit enclosures will be constructed. The south enclosure interior will house a small orientation theatre.

Monumental Stair – The Monumental Stair will serve as the main access to the Lower Level of the Entry Pavilion. The stair will be open and transparent in nature to allow for natural light to penetrate the open area below.

Elevator –The elevator will have glass skin. The elevator cab will be finished with durable glass wall panels.

Entry Pavilion Lower Level

While the Lower Level of the Entry Pavilion houses a variety of functions to enhance the visitors experience and comfort, other functions located in the Lower Level are essential to the functioning of the Museum.

Mechanical Room – This room will house the various pieces of mechanical equipment for both Hall 1 – Entry Pavilion and Hall III. This room will need to be large enough to accommodate mechanical equipment.

Electrical Room – This area will serve all the electrical functions associated with the Pavilion.

Restrooms –New restrooms will be provided. The number of restroom fixtures will accommodate for anticipated visitor and staff population (based on occupancy and code calculations). Fixtures will be wall mounted so as to allow for more thorough cleaning under fixtures. Vanity countertop area will have lighting unique to the rest of the restroom and will allow for excellent visual acuity without glare in the vanity area.

Café / Gift Shop – This area will serve as both the Museum Gift Shop and as a grab and go Café. The Café portion will not have a full service kitchen but will include a triple sink (as required for areas in which coffee is served), microwave, and refrigerator. Catering will not take place in the Café. This area will have a transparent glass enclosure.

Café Seating – The seating for the café will allow visitors to rest and re-group either before or after their visit through the museum.

Coat Check– The coat check will be for USDC museum visitors exclusively. The coat check will be located near the main entrance and will not disrupt exhibit flow.

AV / IT Closet – This closet will service the exhibit needs for the Entry Pavilion and will be linked to the AV/IT closet serving Hall II & III exhibits.

Museum Storage – Museum storage will provide USDC with on-site storage for exhibits and events. Event storage will include chairs and tables. This space will also be utilized for redundant/spare items and hardware such as light bulbs, ballasts, light fixtures, monitors, PDAs, computers, etc. Lighting storage will need to be easily accessible, as lights may need to be replaced frequently.

Historic Lobby

Only minor improvements are planned for the historic lobby given its recent restoration as part of the construction of the George C. Marshall Conference Center in 2008.

The lobby currently serves as the east entrance to the Harry S. Truman Building. The following features will remain in the historic lobby:

Telephone Booths
Four Freedoms Mural

Lobby modifications will include the following:

Additional Doors - A door to the historic lobby that gives additional access to Hall III will be introduced. This door will match the historic door that already exists in the southeast corner of the lobby for the Marshall Conference Center.

Directional Graphics - Directional graphics will be integrated into the historic lobby in a discrete manner that will easily guide visitors to Halls II and III without detracting from the historic lobby.

Exhibit Cases

Exhibit Halls II & III

Although ceiling height is restricted, Hall III ceiling height shall be maximized wherever possible.

14 exhibits will be located in Hall II, and 11 exhibits will be located in Hall III. Exhibits are discussed in greater detail below in "User Requirements for Exhibit Areas." In addition to exhibits, the following areas will be included in Hall III.

Hall III: Theatre and Performance Stage – Theatre will provide seating for 30 people to view short films. The room will allow for flat screens on all four walls to permit projection of the film. The area will be enclosed by glass that is not completely transparent as to reduce visibility into and out of the space.

Hall III: Decision Center/ Diplomacy Simulation Classroom –Will work as a classroom for up to 30 people at a time to engage students in short lessons. This classroom will be glass enclosed with the ability to convert it from a classroom to an exhibit space. The glass enclosure will not be completely transparent as to reduce visibility so that classroom occupants will not be distracted by visitors circulating outside.

Halls II & III: Electrical Closet – An electrical closet will service the various exhibits and functions of Hall II & III.

Halls II & III: AV / IT Closet – An audio/visual closet will support exhibit technology for Hall II & III.

Halls II & III: Mechanical Closets & Shafts – Existing will not be removed

Halls II & III: Stairs – This egress stair is currently serving the upper floors of the existing building and will be reconfigured to accommodate the museum.

User Requirements for Exhibit Areas

Most of the exhibits will have audio and/or visual elements as well as several items which will be mounted and/or take up space.

Below is a brief description of each area to provide information required to make decisions regarding lighting, acoustics, audio/visual capabilities, electrical systems space, and mounting capabilities. Requirements for lighting and acoustics in exhibits are summarized in overview of the section "Requirements for The USDC."

Hall I (Entry Pavilion)

Hall I exhibits will be fairly open to the rest of the room to give the visitor a sense of freedom to wander and explore the numerous exhibits in the space, and to make connections between the exhibits.

Entry to Hall I: Jefferson's Welcome

A life size, fully detailed sculptural model of Thomas Jefferson will greet visitors at the front of the building. A brief video/slideshow will play on a welcome panel behind Jefferson. This area will orient the visitor to the U.S. Diplomacy Center, and invite them in.

This space will be a formal space, replicating an embassy entrance. It will be serious and respectful, beautiful and grand.

Path to Diplomacy (Entry Ramp)

Orientation will begin with the ramp into the Pavilion. The Path to Diplomacy will feature five (or more) diplomacy related terms (in large letters) embedded into the ramp together with five video monitors with slide shows that illustrate the real work of diplomacy. Audio will accompany this exhibit.

Passport to Diplomacy

At a visitor services station at the top of the entry ramp (Path to Diplomacy), visitors will find a reception / orientation desk at which they will receive information, maps, an electronic passport (PDA), and other items relevant to the museum.

Welcome Walk

As visitors turn to face the exhibits in the Pavilion, they will find a panel welcoming them into the Center. Audio will accompany this exhibit.

Donor Wall

This large sculpture "wall" features video messages and a list of donor names. Visitors will be listening to and reading messages and names.

Flags of Our World

A band of flags will wrap around the exterior form of the Discover Diplomacy Theater. It will feature interactive stations with touchscreen monitors showing images and videos with audio.

Discover Diplomacy Theater

With powerful, emotional visuals and a stirring soundtrack including a custom orchestral score, an eight minute film will be shown in this 30-person theater space. It will be open to the rest of Hall I, but give a degree of intimacy and separation for visitors to fully engage in the material. A top quality sound system and video system, and a design to block ambient and direct sunlight will be necessary.

Putting Diplomacy on the Map: Beyond Embassies

This exhibit will feature a large scale map of the world. Large scale interactive surfaces will be built into the floor. Audio will accompany this exhibit.

Diplomacy in your life

This large wall exhibit will invite visitors learn about diplomacy using text, videos and images. Through interactive monitors, graphics and maps, visitors will explore several topics.

Operations Center 24/7

This display will consist of a large photo mural covering most of the available wall space. Visitors will pick up telephone receivers to hear phone messages with relevant requests and questions. This exhibit will be equipped with computers and telephones.

The Diplomatic Toolbox

At this exhibit, visitors will use monitors and interactive freestanding stations.

Inside the Secretary's Day

This exhibit will be placed in a central location in the Pavilion where the traffic flow will converge. It will be dignified and impressive, yet also intimate, personal and warm. The exhibit will feature interactive touchscreens, slideshows, video, and artifacts.

Inside the State Department

This exhibit will feature an organizational chart showing the hierarchy of command, while also featuring slideshows of various State Department employees on several video monitors.

Historic Lobby

Mural: Defense of Freedom

When visitors exit the Pavilion or Hall I, they will see the "Defense of Freedom" mural hung above the Historic Lobby. A life size statue of Eleanor Roosevelt will also be here. Visitors will be able to see the mural's detail up close on an oversized screen in the lobby, listen to a narrative regarding the mural either by a docent, their electronic passport (which they are handed upon entering the pavilion) or cell phones.

Several other exhibits will be set up in the historic lobby, providing paintings, text, and graphics.

Hall II

With the exception of the Diplomacy in Action invitation, all rooms in Hall II will feature interactive stations, maps, audio, video, and artifacts. Exhibits in Hall II will be more enclosed than those in the Pavilion to give the visitor a sense of visiting an era or environment that will be introduced in the exhibit.

Diplomacy in Action

This human sized "invitation-like" exhibit wall will welcome the visitors into Hall II

Timeline

The timeline structure itself stretches through time. The structure will be a creative yet modern, and will be glass. Along the surface of the timeline, images and graphics will be applied directly to the glass. Artifacts and several touch screen monitors will be displayed along the Timeline.

Foundations/Great Seal

This exhibit will feature several displays, and will include monitors (some touchscreen) for images and video; audio wands; platforms for artifacts; and several panels for pictures and text. The entire exhibit will consist of several connected walls, leaving at least one side open to enter and exit the exhibit area.

Treaties

This exhibit will create the environment in which a treaty may have been signed in the 1800's. The exhibit will be somewhat, but not completely, enclosed to give the visitor a sense of being in a room. The exhibit will feature several displays, and will include monitor (some touchscreen) for images and video; audio; a centered table on which visitors can interact and sign treaties with artifacts like pens and wax seals.

Growth of a Nation

This large, fully enclosed room will consist of animation, artifacts, images, and audio.

Passports

This nearly fully enclosed gallery will feature interactive displays that showcase various concepts regarding passports. A protected case, with special lighting to highlight exhibits without producing glare on the case or damaging exhibits, will hold a small set of important, fragile, old and/or valuable artifacts.

Display 1: Highlights the colors, artwork, and sizes of passports.

Display 2: Passport Interactive Wall gives viewers an in-depth look at a passport and explains each of the unique parts of a passport.

Display 3: Make Your Own Historic Passport allows visitors to create their own passport in a historic format.

Display 4: Passport Fraud highlights the issue of passport fraud and Diplomatic Security's role in securing passports.

The lighting in these displays should complement the colors and artwork while providing for excellent visual acuity.

Entering the World

This nearly fully enclosed exhibit will feature a wood bench, monitors, exhibit tables featuring various artifacts, multiple audio wands, and an interactive touchscreen monitor, and a reproduction of Versailles Hall of Mirrors. An acoustic fabric wall panel system shall separate the audio wands and touchscreen monitor from the rest of the exhibit.

State Department

This gallery evokes the aura of a grand and regal sitting room. There will be two columns in the gallery that will be covered with images in a salon style display. In the middle of the gallery, the Great Seal will be embedded in the floor. There will be five audio recordings in this gallery. These voices should be delivered without any visible equipment: visitors will sit down in a chair, and hear the personal stories through embedded speakers. The atmosphere shall be formal and respectful. A monitor will provide a slideshow.

Cold War Diplomacy

This exhibit consists of 8 displays.

Display 1: Images, pamphlets, posters, object that all highlight the fears that Americans experienced in their day-to-day life related to nuclear war.
Display 2: The Red Phone will be a starkly lit display in the center of the room. Visitors will be able to pick up the red phone and hear audio.
Display 3: This small display will provide visitors an opportunity to hear and see various segments. A screen showing a running loop of speeches from the era will enrich this display. Footage will be displayed using refurbished old television that keeps with the look and feel of the time period.
Display 4: This will consist of artifacts which includes diaries and pictures
Display 5a: The Iron Curtain will be brought to concrete life by an actual curtain of iron. Audio wands will provide opportunities to hear speeches.
Display 5b: A projection display with audio will be part of this display.
Display 6: Visitors will listen to a series of debates. An image of display of kitchen as would have appeared in the National Exhibition, in which Nixon and Khrushchev debated, will be on display.
Display 7: Oversized dominoes will line up on top of a map, showing exactly how countries were expected to topple in a domino effect.
Display 8: An encased fragment of the Berlin Wall and digital display will allow viewers to explore fall of Berlin wall in more depth.

Technology

This exhibit will have 4 displays:
Display 1: Photographs and related artifacts will be part of this display. Visitors will interact on an interactive screen.
Display 2: This display will highlight the ways messages were communicated with various artifacts like memos, cables, Morse code devices, etc.
Display 3: This display will provide the cut-out of an internal section of an airplane with the Secretary's work area. There will be several photographs in this display.
Display 4: This display will allow visitors to play with older technologies (for example, visitors can type out a simple message using the Morse code). Several other interactive activities will be in this display.

New Hopes, New Challenges

Display 1: Several artifacts will make up this display. A video display shows interviews with ambassadors sharing their experiences. Personal audio wands provide sound.
Display 2: The wall will be filled with images (bombardment of images). Oral interviews with diplomats who worked on some of the issues pictured in the image wall will be played (audio). Artifacts will also be included.
Display 3: Images and artifacts contrast "good trade" activities, with "bad trade" activities
Display 4: A Global Day of Mourning will be a space dedicated to the September 11th attacks. Artifacts from the 9-11 traveling exhibit created by USDC will be on display here.

Display 5: This display highlights the fast-paced nature of modern diplomacy. Audio recordings, video recordings, and images will be available here.

Display 6: This large media wall showcases modern media: Blogs, Facebook, Twitter, Flickr, and YouTube, etc. will be on large monitors. Visitors will be able to explore the DOS. A large TV showing daily briefings will be included in this display.

Embassy Wall

A prominent feature in Hall II will be the Embassy Wall, 60 foot long, interactive, several feet high. The Embassy Wall will be broken into three galleries:

Display 1: Visitors will be encouraged to touch the multitouch surfaces here, long, horizontal screens with electronic images of floor plans. Visitors will activate pre-recorded mini-interviews of people. Visitors will also be able to the observe footage of several events. At another activity in Display 1, an interactive activity will be linked to the "Passport" PDA which visitors hold.

Display 2: Several artifacts on tables make up this display.

Display 3: In this interactive display, visitors receive instructions via audio to locate items.

Dangerous Work of Diplomacy

On the other side of the Embassy Wall:

Display 1: Casework with artifacts and large scale images will make up this display

Display 2: This area will show films, several artifacts, and demonstrations of handling the bomb sniffing dogs.

Display 3: This tribute will be wall with names of people who lost their lives in the service of diplomacy, attached to the wall in a way which can be repositioned over time. The center of these names will have a blank spot with a projection of some of these names randomly arranged, the name in the center of the projection larger and brighter than the others. Under it, a large "magic book" adds depth to the highlighted name by memorializing that person's story...when visitors first approach the exhibit, names will be floating projected on a wall surface, and when the pages will be "turned" by the projected names flow above to reflect that.

Meet the Diplomats

This exhibit will feature six differently-shaped large-scale HD video vertical touchscreens. Visitors interact by touching the surfaces of the screen to "ask" preset questions

Secretaries Row

Here visitors will explore through animated portraits. Information will be able to be keyed to the PDA and emailed home. Artifacts will accompany the portraits. Also here will be a desk, filled and topped with artifacts.

Hall III

This Hall includes formal classrooms, equipment for DVC conferencing between school rooms across continents, a changing gallery for temporary exhibits, displays featuring opportunities for visitors to become more involved in diplomacy, and an area providing resources on taking the Foreign Service Exam. Changing exhibits and special events will be part of this hall. While Hall I will be a glass pavilion open to the sky, and Hall II will be an enclosed space where natural daylight is removed, the main area of Hall III shall be in between these two approaches. The windows should be visible, but behind light-blocking surfaces so that they don't create excessive glare. The modulated presence of daylight will bring a special feeling to this Hall (This approach does not apply in the Vault area at one end, or the changing gallery space, both of which do not include natural light.)

Contemplation Respite

A lifelike statue will be at the threshold between Halls II and III. A bench where visitors can sit will be here. A quote will be on the wall. This seating area also provides a natural waiting area for visitors as who are waiting for the next showing in the Theater.

Power of Peace Theater

Museum visitors experience a custom-format video experience while special visitors and audiences at other times can make use of the same space as a screening room for any movie, or even for short performances and/or lecture presentations. The custom format will be a three-screen movie, using large format television screens positioned at the front, left and right of the room. Visitors will sit in benches (though elegant, they will be portable and stackable) and watch as the program unfolds across all three screens.

The wall opposite the Theater will also be occupied. Here, one hundred historic handshake moments will be shown in a collage five images high and twenty wide. They will be color, black and white, contemporary video stills, and even period engravings.

Tackling a Diplomatic Challenge (Classroom – Decision Center)

The Decision Center will be a grand glass box with a 30 foot long table at its center. Doors on all sides will open the room completely to the space around it as needed. Visitors outside the room will be able to walk around it on all sides continuously. The Decision Center will have two modes with daylighting and/or artificial lighting: classroom mode and group interactive mode. People will have the ability to be shielded by screens to avoid distractions, or open for other visitors to view the learning experience. There will be a visible storage collection of artifacts from the USDC that can be seen from all sides. This will be a special feature wall for visitors inside the room too.

Meet the Challenges of Diplomacy (Pods)

Four enclosures will be placed at the perimeter of Hall III. Each of these semi enclosed spaces will have seating for a small group, video playback surface(s), and media interactivity. Small artifacts will be in each pod.

Foreign Service/Protocol/Language Lab

This exhibit will consist of an interactive test on large size touchscreens at a number of stations where each visitor can take at their own pace. The stations will be open to each other so that others can purposely look on and see what the other is doing. The space will also include a simple but strong large scale graphics and text. Volunteers will have room to talk to people interested in Foreign Service careers.

Need Diplomacy? Learn a Language

Here visitors enter into a mock language lab where they can listen to languages through head phones.

Diplomacy in Pop Culture

This display will be fun and familiar. In this display visitors will see and hear various clips.

The Power of Diplomacy

This area shows powerful contemporary images. In a short hallway all visitors must traverse before entering the final space and moving on the changing gallery, a stirring slideshow and quotations surrounds passersby with a profound collection of the great moments that demonstrate the lasting impact of diplomacy. All of the images in this space will be powerful and global, even if depicting intimate individual moments.

Diplomacy and Me

In this exhibit there will be a central bronze figure. Around this sculptural figure, will be a circular room with panels each of which will be dedicated to the most pressing issues in the world today. These motion sensitive screens will become animated and react to visitors' interests when visitors walk toward a topic or cause that interests them.

Mosaic Gallery

This welcoming area will be a space of 1,200 – 1,500 square feet at the end of the visitor sequence in Hall III and will be a temporary or changing gallery for rotating shows of interest to the USDC and visitors. The gallery will be specially designed with a coordinated set of reusable, modular furniture and partition walls. The furniture will be at a high museum grade to welcome loan objects, and will be created so that no matter what configuration the cases are aligned in, they always look fitting because they share dimensions along at least one side and also have common glass details, finish materials deck heights and skirt widths. The partition walls will be on tracks and will not be difficult to move.

Commissioning Process Scope

Develop Owners Project Requirements

CxGBS will assist GSA with defining the Owner's Project Requirements (OPR), as defined in the Executive Summary and Overview sections of this document.

Design Phase

Design phase commissioning will review the building envelope, mechanical system and electrical system design. The commissioning authority will provide:

- Design document review with comments and response requirements
- Design phase commissioning report
- Commissioning plan
- Commissioning specifications to the designers incorporating commissioning and operator training requirements into the project
- Specific design checklists to be used by the design and construction team during the delivery of the project

General

Review of the drawings and specifications will concentrate on how the designers have met the owner's project requirements as defined in this document.

Architectural Design Phase Commissioning

Review of architectural drawings and specifications will concentrate on the systems and components that constitute the exterior building envelope in Phase I of the project. For this project, this will consist of the glazing that makes up the roof and walls of the Pavilion. The commissioning team will provide specific attention to building materials, interior and exterior finishes, wall systems, location of wall system vapor retarders, and air barriers as related to building performance. The focus of attention will be on constructability, minimizing potential water and moisture intrusion. A comparison will be made of the construction details with respect to those designs more commonly associated with moisture intrusion and IAQ problems.

Mechanical Design Phase Commissioning

The review of the mechanical drawings and specifications will concentrate on design, efficiency, humidity and odor control, safety, and the ability to provide occupant comfort. The commissioning team will assess the ability of the HVAC system to control airflow throughout the building. Evaluations shall be made on equipment sizing and selection, filtration, adequacy of the make-up air system to pressurize the building envelopes and their interstitial spaces, balance

between make-up air and building exhaust—both internally and externally, environmental and energy management controls, equipment layout, and start-up procedures.

Electrical Design Phase Commissioning

The review of electrical drawings and specifications will concentrate on lighting controls and daylighting systems, lighting efficiency, illumination levels, fire alarm system detection, suppression and alarm, and audio/visual and data systems for interactive exhibits.

Plumbing Design Phase Commissioning

The review of plumbing system drawings and specifications will concentrate on the design of potable water systems. The commissioning team will review domestic water systems and heaters.

Construction Phase Commissioning

The commissioning authority will develop construction checklists and functional testing procedures to be used by the contractors to determine acceptance of the contractors work. Specific functional testing procedures are developed to verify system performance and functionality in accordance with contract documents. The following systems will be commissioned:

Table 2: Systems to be commissioned during Construction Phase

<table>
<tr><th colspan="2">Building Envelope</th><th colspan="2">Plumbing System</th></tr>
<tr><td colspan="2">1. Roof
2. Sheet metal flashing and trim
3. Joint sealers
4. Skylights
5. Curtain wall and storefront
6. Louvers</td><td colspan="2">1. Domestic water systems
2. Domestic water heaters</td></tr>
<tr><th colspan="2">HVAC System</th><th colspan="2">Electrical</th></tr>
<tr><td>1. Air Handling Units
2. Air distribution systems
3. Exhaust systems
4. Building automation system, associated hardware, and interfaces
5. Make-up air systems
6. Variable frequency drives
7. Terminal units (air) VAV
8. Energy Recovery Unit
9. Computer Room Air Conditioning (CRAC) Units
10. Chilled Water Piping
11. Hot Water Piping</td><td>12. Reheat coils
13. Fire and smoke dampers
15. Heat exchangers
16. Testing, adjusting, and balancing work
17. Indoor air quality
18. HVAC Pumps
19. Steam Humidifiers
20. Sequencing of tie-ins to central plant systems</td><td>1. Exterior lighting control
2. Interior lighting control
3. Daylighting controls
4. Path of egress lighting
5. Occupancy sensors for lighting control
6. Multi-level switching</td><td>7. Fire alarm system (detection, suppression, and alarm)
8. Audio /visual and data systems for Interactive exhibits</td></tr>
</table>

The commissioning authority will facilitate the following tasks:

- Review final O&M Manuals prior to turn-over to owner for completeness and as required for system training.
- Facilitate training sessions by coordinating a schedule with the construction team for conducting training in accordance with the training requirements.

- Prepare an Executive Summary of the results of the commissioning program and training session, as well as written documentation verifying that equipment testing is complete and equipment is operating as intended.

Warranty Phase Commissioning

CxGBS will coordinate and supervise required seasonal (or deferred) testing, deficiency corrections, and provide the final testing documentation for the commissioning record and O&M Manuals. CxGBS will pressure map the building to verify that the HVAC system is maintaining the correct internal and external pressurizations.

Appendix A - OPR Workshop Results

Question & Answers	Response Rank
A. What information is required to operate the museum/visitor center?	
Create an operating guide for staff and volunteers	1
Control of the solar load (natural lighting)	2
Operational needs (utilities etc.)	3
Security of both exhibits and occupants	3
Hours of operation	4
Building automation systems	5
Acoustics of the space	6
Vendor requirements and logistics (café, bookstore, deliveries)	6
How and where to access equipment that requires maintenance	6
Signage/way-finding to direct visitors	7
Function of hours & days of operation/# full time staff/peak # visitors expected	7
Time of year or season	8
Pest control	8
What reliability and redundancy for systems	8
Process for changing objects out of cases	8
How much power is needed	8
Where is it best to address large groups?	8
How much outside air is needed	9
What events or special functions will be accommodated	9
Status of fire protection/doors/elevators/lightings/plumbing/HVAC	9
Critical and emergency power requirements	10
B. List conditions that are important to provide a positive visitor experience.	
Climate/temperature	1
Smoothly run security screening	2
Warm welcome	3
Friendliness of staff	3
Signage/way-finding to direct visitors	4
Restroom	5
Great lighting	6
Acoustics of the space	7
interesting exhibits	8
Cleanliness	9
Participation/involvement and interaction	9
Program offerings (tour, public programs etc.)	9

Accessibility/logistics of getting people in and out	10
Places to sit	10
user friendly	11
Food	11

C. List conditions that are important to your comfort in an ideal building.

Temperature and humidity control	1
Noise level	2
Seating	3
Daylighting	4
Comfort facilities	5
Interior design	5
Lighting ambiance	6
Ability to understand programs, exhibits, know what is available	7
Good floor to stand on	7
Where there is print, large enough to read	7
Visual connectivity to outside	8
Freedom of movement	8
Easily find ones way around	9
Air movement/ventilation, IAQ	9
Bottlenecks (crowd control, crowd access)	9
Security	9
Clutter free (not too many objects, furnishings)	9
No tripping obstacles	9
No lines at the restroom	10
Clean, fresh air	10
Attentive staff	11

D. How should we benchmark the building's performance?

People who visit, stay	1
High Statistics for visitor-ship (compared to museums in the area of same size)	2
Operating cost	3
Critical reviews and publicity	4
Energy efficiency	5
Maintainability	6
Owner management satisfaction	7
Minimum maintenance	8
Performs as was designed (energy, ventilation, function)	9
Few complaints	9
You can see out the windows	10
Longevity/durability	10
How well it conveys the message	10
Number and frequency of repairs	11
Use by high level staff and/or visitors	11

E. What training is required to properly operate and maintain the facility?

Training in knowledge of building systems (where and how)	1
Emergency protocol training (security staff etc.)	2
Hospitality training (security, janitors, staff)	3
USDC staff training for visitors, exhibits, programs (how to use space)	3
HVAC and mechanical as related to exhibitions	4
Create master schedule for preventative maintenance tasks	5
IT training	6
Training in understanding mission of museum, exhibits, engaging visitors	7
Material handling (trash, publications, exhibits, supplies, etc.)	8
Security, maintenance, and USDC staff need to know each other (key contacts)	9
Training cleaning crew for care of finish materials	9
Training for cleaning of exterior glass	9
Training on presentation controls on lower level	10
Train overall state department staff on nuances of building	10
Who to call when you need attention	10
Preservation of exhibits in case of emergencies (fire, flood, HVAC, etc.)	11
Custodial staff training (requirements of working in exhibit spaces)	12

Appendix B - Operations & Maintenance Training Video Editing Format

Training should be broken down by system (e.g. Fire alarm safety, electrical panel-boards, exhaust fans, air handling units, etc.). Within each system, video should be broken down into easily digestible segments on clearly identified topics so that maintenance staff can quickly find available information. Following is a basic outline for editing.

1. First System (Fire alarm safety, electrical panel-boards, exhaust fans, air handling units, domestic water heaters, etc.)
    a. Overview of System
    b. General purpose of the system or equipment
    c. Relevant health and safety issues, concerns, and special safety features (if applicable)
    d. Review of control drawings and schematics (if applicable)
    e. Controls (if applicable)
        i. Integral controls (packaged): programming, troubleshooting, alarms, manual operation
        ii. Building Automation Controls (BAS): programming, troubleshooting, alarms, manual operation, interface with integral controls
    f. Interactions with other systems, operation during power outage and fire (if applicable)
    g. Energy conserving operation and strategies (if applicable)
    h. Service, maintenance and preventative maintenance (sources, spare parts inventory, special tools, etc.) (if applicable)
    i. Special requirements of tenants for this equipment's function (if applicable)
    j. Common troubleshooting issues and methods, control system warnings and error messages, including using the control system for diagnostics (if applicable)
    k. Any special issues to maintain warrant (if applicable)
    l. Question and Answer Session
2. Repeat for each system

Appendix C - Cleaning Training Video Editing Format

Training should be broken down by type of cleaning trained on (e.g. Exhibit artifacts, restrooms, etc.). Following is a basic outline for editing.

1. Museum Specialist Cleaning
    a. Exhibits and artifacts
    b. Exhibit finishes
    c. Plexiglass
    d. Other specialized cleaning
        i. Each additional specialized cleaning topic shall be a new chapter
2. Janitorial Cleaning
    a. Base building finishes
    b. Monitors
    c. Glass roof and walls
    d. Restrooms
    e. Light bulb replacement
    f. Other non-specialized cleaning
        i. Each additional non-specialized cleaning topic shall be a new chapter

Final Plan

Design Phase Commissioning Plan

Prepared for

Harry S. Truman - U.S. Diplomacy Center

2201 C Street, NW

Washington, DC

November 2, 2011

Serving the Life of Your Building
Commissioning & Green Building Solutions, Inc.

Table of Contents

SECTION 1

Overview

Commissioning & Green Building Solutions, Inc. (CxGBS®) has been contracted by GSA as the Commissioning Authority (CxA) for the design and construction phases of the U.S. Diplomacy Center project. The project will be separated into two (2) design phases: design development, and construction documentation.

For each drawing and specification distribution (for design reviews, revisions, addenda's, etc) CxGBS® shall receive one (1) set of electronic (.PDF) files containing all drawings and specifications.

The Commissioning Process is a quality-oriented process for achieving, verifying, and documenting that the performance of facilities, systems, and assemblies meets defined objectives and criteria. The defined objectives and criteria against which the project will be evaluated will be contained in the Owner's Project Requirements developed by CxGBS®. The designer's basis of design which documents the design's assumptions and operating intent shall accompany the design documents submitted for review. A construction phase commissioning plan will define the roles and responsibilities of the project delivery team through project construction and acceptance with actual verification of commissioned systems performance.

Commissioning during design is intended to achieve the following specific objectives:

- Document Owner's project objectives and criteria detailing how the building will be used and operated.
- Conduct design reviews that:
  - Identify areas of concern that can contribute to not meeting the owner's project requirements.
  - Identifies areas of opportunity for cost reduction (VE), or alternatives for consideration.
- Integration of the commissioning requirements into the project.
- Defining training requirements for operational staff/contractor.
- Verification that concerns and opportunities identified in the design reviews are resolved.

CxGBS® will manage the design and construction commissioning process and conduct reviews of project and sustainability goals. During the course of the design review, **CxGBS® may provide feedback concerning the design concept, design criteria, quality control and compliance with codes but does not have responsibility for these areas of the project.** This feedback would arise from incidental **observations of these concerns and should not be construed as representing a peer-review** of the design.

This document identifies project team members, defines their roles and responsibilities within the process, and describes the Design Phase Commissioning Process.

SECTION 2

Project Information Summary

Project Information

Project Name:	U.S. Diplomacy Center
Location:	2100 C Street, Washington, DC
Building Type (office, court, school, etc):	Office, Museum
Site Area (acres):	
Unbuilt Site Area (acres):	
Building Square Footage:	
Building Footprint (SF):	
Expected number of stories:	
Budget per Square Foot ($):	
Agency:	GSA
Tenants:	U.S. State Department
Design Period:	February 15, 2012
Construction Period:	
Estimated Completion Date:	

Design Project Team Data for Design Phase

Role	Company & Contact	Contact Information
Owner's Representative Project Manager	Name: Ronald Lucas Company: GSA	Office: 202-401-0183 Mobile: (b) (6) Fax: 202-708-4982 Email: Ronald.lucas@gsa.gov
Owner's Representative Mechanical Engineer	Name: Ronald Wood Company: GSA	Office: 202-260-1250 Mobile: Fax: 202-708-4964 Email: Ronald.wood@gsa.gov
Agency's Representative Project Manager	Name: Bennett Varghese Company: State Department	Office: 202-647-7454 Mobile: (b) (6) Fax: Email: VargheseB@state.gov

Client's Representative Program Officer	Name: Douglas Mossman Company: USDC	Office: 202-736-9041 Mobile (b) (6) Fax: 202-708-4982 Email: mossmandm@state.gov
Client's Representative Curator	Name: Priscilla Linn Company U.S. Dept. of State	Office: 202-736-9043 Mobile: (b) (6) Fax: Email: vargheseb@state.gov
Environmental Director	Name: Julie Sobelman Company: U.S. Dept. of State	Office: 202-667-6013 Mobile: Fax: Email: sobelmanje@state.gov
Construction Manager	Name: Company: TBD	Office: Mobile: Fax: Email:
Commissioning Authority (CxA)	Name: (b) (6) Company: CxGBS	Office: (770) 831-6760 Mobile: (b) (6) Fax: (770) 831-6761 Email (b) k@cxgbs.com
Design Manager	Name: (b) (6) Company: Beyer Blinder Belle	Office: 202-333-8000 direct: (b) (6) Fax: 202-333-8843 Email: (b) (6) @bbbarch.com
Architect LEED AP	Name: (b) (6) Company: Beyer Blinder Belle	Office: 202-333-8000 direct: 202-333-8004 Fax: 202-333-8843 Email (b) (6) bbbarch.com
Mechanical / HVAC Designer	Name: (b) (6) Company: Vanderweil Engineers, Inc.	Office: 703-683-9700 Mobile: Fax: 703-683-2480 Email: (b) (6) @vanderweil.com
Mechanical / Lead HVAC Designer	Name (b) (6) Company: Vanderweil Engineers, Inc.	Office: 703-683-9700 Mobile: Fax: 703-683-2480 Email: (b) (6) @Vanderweil.com

Lead Electrical Designer	Name: (b) (6) Company: Vanderweil Engineers, Inc.	Office: 703-683-9700 Mobile: Fax: 703-683-2480 Email (b) (6) @vanderweil.com
Lead Plumbing Designer	Name: (b) (6) Company: Vanderweil Engineers, Inc.	Office: 609-919-6407 Mobile: Fax: Email: (b) (6) @vanderweil.com
Civil Designer	Name: (b) (6) Company: Wiles Mensch Corp.	Office: 202-638-4040 Mobile (b) (6) Fax: Email (b) (6) wilesmensch.com
Life Safety/ Fire Protection/ Security Engineer	Name: (b) (6) Company: The Protection Engineering Group	Office: 703-488-9990 Mobile: (b) (6) Fax: 703-488-9994 Email: (b) (6) @pegroup-inc.com
Exhibit Designer	Name: (b) (6) Company: C&G Partners LLC	Office: 212-532-4460 Mobile: Fax: 212-532-4465 Email: (b) @cgpartnersllc.com
Acoustics/ AV/ Telecomm.	Name: (b) (6) Company: Convergent Technologies Design Group, Inc.	Office: 410-532-2395 Mobile: Fax: 410-532-2396 Email (b) (6) @ctdginc.com
Specifications	Name: (b) (6) Company: Heller &Metzger,PC	Office: 202.364.2222 Mobile: Fax: 202.234.5502 Email (b) (6) @hellerandmetzger.com

SECTION 3

Roles and Responsibilities

Task

A list of the responsibilities and tasks for each party of the design team are presented in Table 1. An assigned lead for each given task is identified in Table 1. The lead will coordinate the completion of the task. Under each task listing are subtasks with "X" marked by the participating team numbers.

Scope

Section 4 provides additional detail regarding scope of the tasks listed in Table 1.

Reporting

Members completing subtasks report to the lead for that task, per Table 1. The task lead reports to the Coordinator lead (the lead in Task 1), i.e. CxGBS® in this project.

Table 1 Summary of Commissioning Roles and Responsibilities during Design Phase									
		Parties Involved							
Task	**Design Phase Commissioning Responsibilities and Tasks**	Commissioning Authority	Architect	Mech. Designer	Electrical Designer	Design Manager	USDC (Client)	GSA\Owner's PM	Using Agency
1	***Overall coordination of commissioning activities during design*** **Lead->**	**X**							
	a. Plan and schedule meetings	X				X	X	**X**	X
	b. See that all tasks are carried out	X				X		**X**	X
2	***Design Phase Commissioning (Dx) Plan*** **Lead->**	**X**							
	a. Provide Project Schedule to CxA					**X**	X	X	X
	b. Draft Dx plan	**X**							
	c. Review and comment on Dx plan						X	**X**	X
	e. Finalize Dx plan	X							
	f. Follow Dx plan	X	X	X	X	**X**	X	X	X
3	***Owner's Project Requirements*** **Lead->**	**X**							
	a. Document owner's objectives and criteria	**X**					X	X	X
	b. Review and comment on OPR						X	**X**	X
	c. Follow OPR	X	X	X	X	X	**X**		
	d. Update OPR as directed by Owner	**X**							
	e. Review Updated OPR for clarity & completeness						**X**	X	X
4	***Basis of Design (BOD)*** **Lead->**	**X**							
	a. Provide format for documentation	**X**							
	b. Document BOD		X	X	X	**X**			
	c. Review BOD for clarity & completeness	**X**					X	X	X
	d. Update BOD as required		X	X	X	**X**			
	e. Review updated BOD for clarity & completeness	**X**					X	X	X

Table 1 Summary of Commissioning Roles and Responsibilities during Design Phase Continued									
		Parties Involved							
Task	**Design Phase Commissioning Responsibilities and Tasks**	Commissioning Authority	Architect	Mech Designer	Electrical Designer	Design Manager	USDC (Client)	GSA\Owner's PM	Using Agency
5	***65% Design Review*** **Lead->**	**X**							
	a. Perform Quality Control review of documents using CxGBS® design phase commissioning checklists prior to issue for DOS/Owner/USDC review		X	X	X	**X**			
	b. Using Dr. Checks review format provide review comments	**X**					X	X	X
	c. Review design review comments	X	X	X	X	X	X	X	X
	d. Respond to comments	X	X	X	X				
	e. Review designer responses	X					X	**X**	X
	f. Facilitate adjudication of comments	X				X	X	X	**X**
	g. Follow direction from owner	X	X	X	X	**X**			
6	***Develop Commissioning Specifications*** **Lead->**	**X**							
	a. Provide CxA project manual table of contents and spec format					**X**			
	b. Develop commissioning specifications for project and commissioning verbiage for design team to weave into project specifications	**X**							
	c. Review commissioning specifications and provide comments / approval						X	**X**	X
	d. Provide designers with commissioning specifications for inclusion into project manual	**X**							
	e. Adapt Cx Specs & include in Division 1		X			**X**			
	f. Adapt Cx Specs & include in Divisions 7, 8, and 9		X			**X**			
	g. Adapt Cx Specs & include in Divisions 22, 23			X		**X**			
	h. Adapt Cx Specs & include in Divisions 11, 26, 27, and 28				X	**X**			
7	***Develop draft construction phase Cx plan*** **Lead->**	**X**							
	a. Develop Const Phase Cx Plan - Draft 1	**X**							
	b. Review Const. Cx plan Draft 1		X	X	X	X	X	**X**	X
	c. Approve Cx plan scope						X	**X**	X
	d. Include draft Cx plan and sample checklists and test procedures as an appendix in project manual		X			**X**			

Table 1 Summary of Commissioning Roles and Responsibilities during Design Phase Continued

		Parties Involved							
Task	**Design Phase Commissioning Responsibilities and Tasks**	Commissioning Authority	Architect	Mech. Designer	Electrical Designer	Design Manager	USDC (Client)	GSA\Owner's PM	Using Agency
8	***Not Used*** **Lead->**								
	a. Perform Quality Control review of documents using CxGBS® design phase commissioning checklists prior to issue for [Using Agency]Owner review								
	b. Using Dr. Checks review format provide review comments								
	c. Review design review comments								
	d. Respond to comments								
	e. Review designer responses								
	f. Facilitate adjudication of comments								
	g. Follow direction from owner								
9	***100% Bid Document Review or Construction Documents*** **Lead->**								
	a. Perform Quality Control review of documents using CxGBS® design phase commissioning checklists prior to issue for DOS/GSA review		X	X	X	**X**	X	X	X
	b. Using Dr Checks review format provide review comments	X					**X**	X	X
	c. Review design review comments	X	X	X	X	X	**X**	X	X
	d. Respond to comments		X	X	X	**X**			
	e. Review designer responses	**X**				X			
	f. Facilitate adjudication of comments					X	**X**	X	X
	g. Follow direction from owner	X	X	X	X	**X**			

Table 1 Summary of Commissioning Roles and Responsibilities during Design Phase Continued

		Parties Involved							
Task	**Design Phase Commissioning Responsibilities and Tasks**	Commissioning Authority	Architect	Mech. Designer	Electrical Designer	Design Manager	USDC (Client)	GSA\Owner's PM	Using Agency
10	***Final Contract Document Review (End of Design Documents + Addendums)*** **Lead->**	**X**							
	a. Perform Quality Control review of documents (Including Specifications) and address/resolve pervious review comments		X	X	X	**X**	X	X	X
	b. After Quality Control Review complete, deliver documents to CxGBS® for commissioning back check					**X**	X	X	X
	c. Perform review of delivered documents focusing on closing unresolved comments from prior reviews	**X**							
	d. Facilitate adjudication of outstanding comments and questions (If needed)						**X**	X	X
	e. Follow direction provided by owner	X	X	X	X	**X**			

Note: -- (Dash) Represents Participation in Listed Task/Event

SECTION 4

Commissioning Scope of Work

General

CxGBS® will manage the commissioning process, develop the owners' project requirements, review the design phase documentation relative to meeting defined LEED® goals, review comments provided by the architect's mechanical and electrical designers assessing that the design is in compliance with the owner's project requirements. The commissioning process will be in accordance with ASHRAE Guideline 0 and meet the US Green Building Councils LEED® requirements for LEED® commissioning prerequisite and the additional commissioning requirements.

Systems to Be Commissioned

The systems to be commissioned are listed in the Owner's Project Requirement:

Building Envelope Masonry Assemblies Air Moisture Wrap Flashing and Sheet Metal Insulation Roofing Joint Sealers Water Repellant Coating Aluminum Entrance, Storefronts and Windows Glazing EIFS	**Plumbing System** Service Water System Service Water Heater(s) Sanitary Sewer System
HVAC System Electric Heaters Split System Units Air Handling Units Air Distribution System General Exhaust Systems Building automation system Fire Suppression/Protection System Testing, adjusting, and balancing (TAB) work Indoor Air Quality	Electrical System Thermography Survey • Service Switch Gear • Switchboards • Distribution Panel Boards • Transformers Grounding and Ground Fault Systems Uninterruptable Power Supplies Lighting/Daylighting Controls Fire Alarm System Electrical/AV/IT Exhibits

Task 1: Coordination of Commissioning During Design

CxGBS® will be the coordinator of the commissioning activities for the commissioning process working under the supervision (see the designation in Table 1) of the owner's construction manager. Our process begins with the development of the Owner's Project Requirements (OPR) followed by the implementation of the commissioning process in both

the design and construction phases of the project. CxGBS® will provide review guidelines to the construction manager's mechanical and electrical reviewers and a current copy of the OPR the reviewers will use in developing their comments during the design reviews as outlined in Table 1. This design phase commissioning (Dx) plan outlines the Dx process identifying the team member's roles & responsibilities. As indicated in Table 1, the Dx Plan is reviewed and approved by the owner. Comments from the owner and the design schedule for the project provided by the Design Manager will be incorporated into the 2nd draft of the Dx plan. Changes as directed by the owner will be made to the Dx plan at the time such direction is received (see Task 2).

Task 2: Design Phase Commissioning Plan

CxGBS® has compiled a draft Design Phase Commissioning Plan based on the initial information received from the design team members and the owner. A tentative schedule is presented in Table 3. The Design Manager with input from the owner reviews the preliminary design schedule and provides appropriate revisions to the design schedule for inclusion in the final commissioning plan and provides updated information on the project schedule and modification updates of design team members. CxGBS® incorporates the comments and information received from the Design Manager, updates the draft design phase commissioning plan, and forwards the updated plan to the Construction Manager and owner for distribution to the project team members. CxGBS® will incorporate any owner approved changes for inclusion into the OPR or final Dx plan. This plan will guide the design phase commissioning process and it is the responsibility of all project team members to follow the processes outlined within.

Task 3: Development of Owner's Project Requirements

CxGBS® assists the Owner with the development of the written Owner's Project Requirements (OPR) that details the owner's objectives and criteria. These objectives and criteria detail the requirements of building users to fulfill their mission. The OPR is reviewed by the Owner and/or Owner's Representative to verify that it accurately reflects the project requirements. The OPR forms the basis from which all design, construction, acceptance, and operational decisions are made. Note that the OPR is considered a living document, and may be updated as directed by the owner as their objectives and criteria become more refined.

Task 4: Basis of Design Documentation

CxGBS® will provide a format for the designers to document the Basis of Design. The purpose of the Basis of Design (BOD) is to record in one document the underlying assumptions that are made by the designers to meet the owner's stated objectives and criteria in the OPR as the design progresses. Designers should provide sufficient detail in the Basis of Design to clearly communicate these assumptions to other knowledgeable professionals. The Basis of Design shall be used as a resource for the Owner when operating the facility or planning for any building or system renovations, retrofits or expansions. The following information should be included in the Basis of Design:

- Specific description of systems, components and methods for achieving the design intent objectives (for example, for a rooftop air conditioning unit include: why this system was chosen above others, details of size, efficiencies, areas served, capacity control details, compressors, coils, dampers, setpoints, filters, economizers, minimum ventilation control, control type, noise and vibration criteria, tie-in to other systems, sequences of operation under all modes of operation, control strategies, etc.)

- Equipment maintainability
- Fire, life, safety: criteria, general strategy narrative and detailed sequences
- Emergency power control and function
- Energy performance
- Ventilation strategies and methods
- Complete sequence of operation, including setpoints and control parameters
- Schedules
- Applicable codes and standards
- Primary load and design assumptions
- Diversity used in sizing
- Occupant density and function
- Indoor conditions (space temperature, relative humidity, lighting power density, ventilation and infiltration rates, etc.)
- Outdoor conditions
- Glazing fraction, U-value and shading coefficient

Each member of the team provides the system description, the written Basis of Design and detailed sequences of operation for the areas of design that are their responsibility. The project's architect or Design Manager will act as the design documentation task lead and coordinate the creation of the full design documentation by the design team. Design Team members submit the documentation in parts to the Design Manager at predetermined phases of design. CxGBS® reviews the BOD for clarity and completeness and provides comments and recommendations to the USDC/DOS/GSA Project Managers. The Design Manager and USDC/DOS/GSA Project Managers review comment on and approve the submissions. The Basis of Design required here is not a substitute for what may be required in the specifications or contract for other systems.

Task 5: 65% Design Review

At the completion of the Schematic Design, CxGBS® will review the design along with the other design team members. The documents delivered to CxGBS® should have already passed an internal quality control review performed by the design firm.

CxGBS® will compare the design with the documented objectives and criteria identified in the OPR. CxGBS® will identify and document concerns and opportunities for the designers and owner to consider during the development of contract documents. Though CxGBS® may review those areas, they are not responsible for design concept, design criteria, quality control or compliance with codes.

CxGBS® will document the Schematic Design Review in written form and forward it to the Design Manager and Owner's Representative. The Design Manager will distribute the comments to the design team members. Using the CxGBS® Design Review Form, the team members will respond to CxGBS's® comments and provide them to CxGBS® and the USDC/DOS/GSA Project Managers through the GSA Project Manager.

CxGBS® will facilitate an adjudication process with the designers and the Owner's Representative for any comments or concerns that remain outstanding after the written responses from the designer.

Task 6: Commissioning Specification Development

The specifications incorporate the construction commissioning requirements into the project and provide detail and specific criteria that will be used during the commissioning process to help ensure the contractors implement a quality control process that is designed to results in the verification of commissioned system performance and minimize call backs in the warranty period. Sample construction checklists and testing procedures along with the specifications are provided to communicate to the bidding contractors the quality control process they will be part of and what their role and responsibilities are during the commissioning process. CxGBS® develops and provides full commissioning specifications for commissioned equipment and assemblies. The specifications provide a clear understanding to all participants their specific roles, responsibilities, effort, testing procedures and pass/fail criteria for the project.

To facilitate the timely provision of Cx specifications by CxGBS®, the Design Manager should provide CxGBS® with a specification Table of Contents and sample format during the Schematic Design phase of the project. CxGBS® will develop the Cx specifications during the Design Development Phase of the project and will provide them to the Design Manager in electronic format for inclusion in the 100% contract document submittal.

The Cx specifications will be reviewed, modified and blended into the project specifications by the designers.

Task 7: Develop Draft Cx Plan for Construction Phase

When the drawings, traditional specifications (non-commissioning), and BOD are 90% completed, CxGBS® will develop the draft construction phase commissioning plan for this project. The plan summaries the commissioning specifications, provides format for establishing communication protocols, and roles and responsibility of project team members tasked with executing the construction Cx requirements in accordance with the project specifications. The construction phase Cx plan is reviewed with the construction team at a commissioning meeting which typically concedes with a regular progress meeting. Input from the progress meeting participants are integrated into the draft construction commissioning plan which typically includes specific team member information, communication protocol, and schedule of construction deliverables to the CxA are incorporated into the construction Cx plan.

The above information, along with contact information for and identification of responsibilities for individuals who are fulfilling Cx responsibilities will be documented in a final Cx Plan. This final plan will be issued by CxGBS® for use by the Construction Cx Team. The plan will contain a list of the systems and specific equipment and components to be commissioned as well as the general commissioning contractor deliverables, such as Test & Balance Plans, Start-Up Procedures, and O&M documentation & training. Additionally, the plan will contain the timeframes by when the CxA needs to receive the deliverable mentioned above.

The Design Manager and USDC/DOS/GSA Project Managers will review both drafts of the plan and provide comments to CxGBS®. CxGBS® will incorporate owner approved changes into the final Cx Plan.

Task 8: Not Used

Task 9: 100% Phase 1 Bid Document Review (Construction Documents)

The 100% Contract Documents Review is similar to the 65% Contract Documents Review (Task 5). At this stage, the documents should also include project specifications that have passed an internal quality control review performed by the design firm.

Task 10: Final Phase 1 Bid Document Review

The Final Contract Document Review is intended to be a back-check of prior review comments and an opportunity for CxGBS® to evaluate how the building and its systems will be commissioned. Any outstanding concerns will be addressed in an adjudication process facilitated by CxGBS®.

SECTION 5

General Schedule

Table 2 Commissioning Schedule – Design Phase

	Design Phase Tasks	Pre-Design	Schematic Design	Design Development	Construction Documents
1	*Overall coordination of the Cx work during Design*				
2	*Develop and Finalize the Cx plan for Design Phase*				
	a. Scoping Meeting				
3	*Develop Owner Objectives*				
4	*Basis of Design documentation*				
5	*Focused design review*				
	a. Schematic Document Review				
	b. 50% Contract Documents Review				
	c. 90% Contract Document Review				
	d. Commissioning Faciliatation Review				
6	*Draft Cx plan for Construction Phase*				
7	*Develop Cx specifications for construction*				
8	*Commissioning Facilitation*				

Table 3 Project Schedule

Event Description:	Date:
Develop Owner's Project Requirements	
Develop Draft Commissioning Plan for Design	
Submit Draft Design Cx Plan for Owner Comment	
Develop Draft Cx Plan for Construction	
Submit Draft Construction Cx Plan for Owner Comment	
Develop Final Cx Plan for Construction	
Develop Commissioning Specifications	
Schematic Design Documents	
Selection of Design/Build Team	
Award of Contract to Design/Build Team	
50% Contract Documents Review	
90% Contract Documents Review	
Construction Phase Begin	

Draft Plan

Construction Phase Commissioning Plan

Prepared for

Harry S. Truman - U.S. Diplomacy Center

2201 C Street, NW

Washington, DC

October 2, 2014

Serving the Life of Your Building

Commissioning & Green Building Solutions, Inc.

Table of Contents

SECTION 1

Overview

Commissioning & Green Building Solutions, Inc. (CxGBS®) has been contracted by GSA as the Commissioning Authority (CxA) for the design and construction phases of the U.S. Diplomacy Center (USDC) project.

1.1 Abbreviations and Definitions

The following are abbreviation used in this document. Definitions are found in Section 019100 of the Specifications.

A/E =	Architect and design engineers	GLC =	Glazing contractor
CxA =	Commissioning Authority	CM =	Construction Manager
CC =	Controls contractor	MC =	Mechanical contractor
Cx =	Commissioning	CK =	Construction Checklist
Cx Plan =	Commissioning Plan document	PM =	Project manager
EC =	Electrical contractor	SC =	Sealant contractor
FT =	Functional performance test	SMC =	Sheet metal contractor
GC =	General Contractor	Subs =	Subcontractors to GC
		TABC =	Test and balance contractor

1.2 Purpose of the Commissioning Plan

This construction phase commissioning plan serves to provide direction for the commissioning process during construction, define roles and responsibilities, identify procedures for resolution of issues, and define participation of the project team, actual lines of reporting and approvals, coordination, etc.

This plan does not provide a detailed explanation of required testing procedures. Specific testing requirements are contained in the functional testing requirements.

1.3 Commissioning Scope

The Commissioning Process is a quality-oriented process for achieving, verifying, and documenting that the performance of facilities, systems, and assemblies meets defined objectives and criteria. The Owner's Project Requirements (OPR) and the Designer's Basis of Design (BOD) form the project's objectives and criteria. The commissioning process systematically verifies that the building systems perform as intended to meet the owner's objectives and criteria.
The construction phase portion of the commissioning process helps identify potential problems during installation to assist contractors with minimizing rework, punchlists and call backs which impact project costs. Early corrections can decrease construction time and improve the teams' profitability because deficiencies are minimized and corrections are made while material and resources are still on-site.

During the construction phase commissioning, construction checklists that are tailored to each discipline/trade will be given to contractors and subcontractors. Contractors will be required to complete construction checklists as work progresses and submit the completed checklists with their monthly pay applications. The construction checklists are then verified by CxGBS®. CxGBS®, during their scheduled site visits, will verify selected checklists completed by the contractors. As deficiencies are identified, they will be recorded into the commissioning issues log and reviewed with the construction team. Once a deficiency has been corrected, Contractor's employee having direct knowledge of the corrected deficiency notifies the GC who updates the issue log indicating the deficiency has been corrected and forwards the updated issues log to CxGBS®. During a CxGBS® site visit, the correction will be verified by CxGBS®.

GSA compensates CxGBS® for two (2) verifications of completed construction checklists which include the initial verification and follow-up after correction. Additional verifications are back-charged to the contractor responsible for the associated work. Repeated installation problems will require additional verification by CxGBS® and will be back-charged to the responsible contractor.

Working closely with the contractors, CxGBS® assist in the verification of the start-up plan for mechanical, electrical, and plumbing equipment to help verify systems are protected during construction, and meet construction IAQ management requirements, as well as owner and contractor needs. As systems are started system components will be performance tested and initial owner training will be conducted. When systems and construction checklists are completed commissioning testing of the entire system will be conducted marking substantial completion for the tested system. Final commissioning testing of all systems will be conducted when all systems in a specific portion of the project are complete.

After completion of the final commissioning testing, the controls contractor will provide trend logs of specific points to CxGBS® for monitoring.

Commissioning during the construction phase of this project is intended to achieve the following specific objectives according to the Contract Documents.:

- Ensure that applicable equipment and systems are installed properly and receive adequate operational checkout by installing contractors.
- Verify and document proper performance of equipment and systems
- Verify that O&M documentation left onsite is complete.
- Verify that the Owner's operating personnel are adequately trained.

1.4 Commissioning Systems

The following systems will be commissioned in this project. Refer to Section 5 of this document for additional details. All references to equipment in this document refer only to equipment that is to be commissioned.

Building Envelope Damp and Water Proofing Flashing and Sheet Metal Insulation Joint Sealers Glazing Curtainwall System Exterior Doors Exterior Louvers and Vents	**Plumbing System** Domestic Hot Water System Sump Pumps
HVAC System Air Handling Unit Energy Recovery Unit Computer Room Air Condition Unit Fan Coil Unit VAV Terminal Units Variable Frequency Drives Air Distribution System Building automation system Fire Suppression/Protection System Testing, adjusting, and balancing (TAB) work Indoor Air Quality	**Electrical System** Lighting/Daylighting Controls AV/IT for Exhibits

1.5 Forms

Forms used during commissioning are referred to in this plan by the format: Form C-xx, where the "C" represents Construction Phase. Blank versions as well as some sample filled-out versions are found in Appendix 1 of this plan.

SECTION 2

Project Information Summary

Project Information

Project Name:	U.S. Diplomacy Center
Location:	2100 C Street, Washington, DC
Building Type (office, court, school, etc):	Office, Museum
Site Area (acres):	
Unbuilt Site Area (acres):	
Building Square Footage:	
Building Footprint (SF):	
Expected number of stories:	
Budget per Square Foot ($):	
Agency:	GSA
Tenants:	U.S. State Department
Design Period:	September 19, 2011 – April 15, 2012
Construction Period:	June 2014 - December 2015
Estimated Completion Date:	December 2015

Design Project Team Data for Construction Phase

Role	Company & Contact	Contact Information
Owner's Representative Project Manager	Name: Ronald Lucas Company: GSA	Office: 202-401-0183 Mobile: (b) (6) Fax: 202-708-4982 Email: Ronald.lucas@gsa.gov
Owner's Representative Mechanical Engineer	Name: Ronald Wood Company: GSA	Office: 202-260-1250 Mobile: Fax: 202-708-4964 Email: Ronald.wood@gsa.gov
Agency's Representative Project Manager	Name: Bennett Varghese Company: State Department	Office: 202-647-7454 Mobile (b) (6) Fax: Email: VargheseB@state.gov
Client's Representative Program Officer	Name: Douglas Mossman Company: USDC	Office: 202-736-9041 (b) (6) (b) Fax: 202-708-4982 Email: mossmandm@state.gov
Client's Representative Curator	Name: Priscilla Linn Company U.S. Dept. of State	Office: 202-736-9043 Mobile: (b) (6) Fax: Email:
Environmental Director	Name: Julie Sobelman Company: U.S. Dept. of State	Office: 202-667-6013 Mobile: Fax: Email: sobelmanje@state.gov
Construction Manager	Name: (b) (6) Company: Heery International	Office: 202-409-1769 Mobile: Fax: Email: (b) (6)@heery.com
Commissioning Authority (CxA)	Name: David Cantrill	Office: 770- 831-6760 ext. 140 Mobile: (b) (6)

Role	Company & Contact	Contact Information
	Company: CxGBS	Fax: 770- 831-6761 Email (b) (6) 3@cxgbs.com
Design Manager	Name: (b) (6) Company: Beyer Blinder Belle	Office: 202-333-8000 direct: (b) (6) Fax: 202-333-8843 Email: (b) (6) @bbbarch.com
Architect LEED AP	Name: (b) (6) Company: Beyer Blinder Belle	Office: 202-333-8000 direct: (b) (6) Fax: 202-333-8843 Email: (b) (6) @bbbarch.com
Mechanical / HVAC Designer	Name: (b) (6) Company: Vanderweil Engineers, Inc.	Office: 703-683-9700 Mobile: Fax: 703-683-2480 Email (b) (6) @vanderweil.com
Mechanical / Lead HVAC Designer	Name: (b) (6) Company: Vanderweil Engineers, Inc.	Office: 703-683-9700 Mobile: Fax: 703-683-2480 Email (b) (6) Vanderweil.com
Lead Electrical Designer	Name: (b) (6) Company: Vanderweil Engineers, Inc.	Office: 703-683-9700 Mobile: Fax: 703-683-2480 Email (b) (6) s@vanderweil.com
Lead Plumbing Designer	Name: (b) (6) Company: Vanderweil Engineers, Inc.	Office: 609-919-6407 Mobile: Fax: Email: (b) (6) @vanderweil.com
Civil Designer	Name: (b) (6) Company: Wiles Mensch Corp.	Office: 202-638-4040 Mobile (b) (6) Fax: Email (b) (6) wilesmensch.com
Life Safety/ Fire Protection/	Name: (b) (6)	Office: 703-488-9990

Role	Company & Contact	Contact Information
Security Engineer	Company: The Protection Engineering Group	Mobile: (b) (6) Fax: 703-488-9994 Email (b) (6) @pegroup-inc.com
Exhibit Designer	Name: (b) (6) Company: C&G Partners LLC	Office: 212-532-4460 Mobile: Fax: 212-532-4465 Email (b) (6) cgpartnersllc.com
Acoustics/ AV/ Telecomm.	Name: (b) (6) Company: Convergent Technologies Design Group, Inc.	Office: 410-532-2395 Mobile: Fax: 410-532-2396 Email: (b) (6) @ctdginc.com
Lighting Designer	Name: (b) (6) Company: George Sexton Associates	Office: 202-337-1903 Mobile: Fax: 202-337-0047 Email (b) (6) @gsadc.com
Specifications	Name: (b) (6) Company: Heller & Metzger,PC	Office: 202.364.2222 Mobile: Fax: 202.234.5502 Email (b) (6) @hellerandmetzger.com

SECTION 3

Roles and Responsibilities

3.1 Team Members

The members of the commissioning team consist of the CxA, GC, PM, A/E (particularly the mechanical & electrical engineers), MAC, GLC, SC, SMC, MC, EC, TABC representative, CC, and other installing subcontractors or suppliers of equipment to be commissioned as well as USDC museum operation and facility management personnel.

3.2 General Management Plan

Commissioning & Green Building Solutions, Inc (CxGBS®) is the Commissioning Authority (CxA) for the USDC museum project and reports directly to USDC, the Owner's Representative. The CxA's responsibilities, along with all other contractors' commissioning responsibilities, are detailed in the Specifications.

The primary role of the CxA is the development, coordination and execution of this Cx Plan. Our construction observations, verification of contractor completed checklists and overall performance of commissioned systems starts at the completion of structural and ends at the end of the warranty period. The CxA will verify that systems and equipment are functioning in accordance with the requirements of the Contract Documents and assist the owner/PM in developing correct and complete documentation of the construction effort. The CxA is not responsible for design concepts, design criteria, compliance with codes, design, or general construction scheduling, cost estimating, construction management or construction supervision. The CxA may assist the project team by identifying who has responsibility for correcting identified issues, problem solving or suggested correction of identified deficiencies, but ultimate responsibility for meeting the project objectives and requirements resides with the A/E team and the Contractor.

The Specifications will take precedence over this Cx Plan. All members shall work together to fulfill their contracted responsibilities and meet the objectives of the Contract Documents.

3.3 General Descriptions of Roles

General descriptions of the commissioning roles are as follows:

CxA : Coordinates the Cx process, performs limited construction observation, identifies concerns and issues to the A/E & PM, writes tests, oversees and documents performance tests, provides limited assistance in problem resolution

PM : Facilitates and supports the Cx process, gives final approval of the Cx work, and approves test plans.

GC : Facilitates the Cx process, ensures that Subs perform their responsibilities and integrates Cx into the construction process and schedule.

Subs : Demonstrate proper system installation and performance.

A/E : Performs construction observation, publishes and tracks issues identified by CxA, reviews/modifies and issues Cx Specifications, approves O&M manuals and assists in resolving problems.

Mfr. : The equipment manufacturers and vendors provide documentation to facilitate the commissioning work and perform contracted start-up.

SECTION 4

Commissioning Process

4.1 Commissioning Scoping Meeting

The CxA will conduct a commissioning scoping meeting. In attendance will be the respective representatives of the GC, MC, EC, CC, TABC, CxA, PM, and A/E. At the meeting, commissioning parties will be introduced and the commissioning process will be reviewed. Management protocol and reporting lines will be determined and established as well as how documents will flow. The draft Cx Plan will be reviewed, process questions will be addressed, lines of reporting and communications will be determined, and the work products list will be discussed. Start-up plans for HVAC equipment will be developed by the mechanical contractor and provided to the CxA for review and approval. MEP contractors and their subs will agree to a proposed commissioning schedule.

CxGBS® will provide construction checklists to the contractors. Contractors will be required to complete the construction checklists weekly for the work performed during the week. Any problems or issues should be reported on the construction checklists. Construction checklists will be submitted along with the contractors pay application to the PM.

CxGBS® will consolidate the information from the construction checklists filled out by the contractors and conduct verification of the work represented on the construction checklists during CxGBS® site visits. Discrepancies will be noted and issues identified will be logged for review by the project team. Field reports and issues logs will be distributed to the project team after each site visit. When all items on the construction checklists are complete the systems are ready for commissioning testing. Scheduling of commissioning testing will be through the GC. Based on construction progress, estimated test dates will be included in the project schedule managed by the GC.

As dates scheduled for commissioning testing near, contractor input is needed to set the specific date CxGBS® and the contractors associated with specific systems being commissioned will be on-site. On the dates scheduled CxGBS will direct, document and verify the system's performance. Systems meeting the requirements as defined in the project will be recommended by CxGBS® to GSA for acceptance.

4.2 Final Commissioning Plan – Construction Phase

Modifications to this final commissioning plan will be limited to adjustments in the schedule of commissioning activities. CxGBS® with the contractors will communicate to the GC changes in the commissioning schedule and fine-tune the schedule as construction progresses. In particular, 60 days prior to start-up of the primary equipment, the CxA will meet with the GC and PM and develops a detailed commissioning schedule. The commissioning plan will then be approved by the PM.

4.3 Site Observation

The CxA, selected staff from building operators and facility management personnel, and the PM if applicable will make periodic visits to the site, as necessary, to witness equipment and system installations. As construction progresses and the building envelope, mechanical, electrical, and plumbing system installation activity increases, the CxA will make two (2) site observations and provide a report after each site observation. Site observation reports are generated to identify issues for correction and the reports are distributed to the team. The A/E and/or PM will provide corrective action direction to the GC.

4.4 Miscellaneous Meetings

The PM provides the CxA with project progress reports and Owner, Architect, Contractors (OAC) meeting minutes to assist with keeping CxGBS® informed. In addition, CxGBS® will attend selected planning and job-site meetings in order to schedule activities, discuss identified issues and remain informed on construction progress and to update parties involved in commissioning. CxA attendance will be via teleconference, unless the meeting coincides with a scheduled site visit, in which case the CxA will attend in person. The PM and GC provide the CxA with information regarding substitutions, change orders, RFIs and any Architect's Supplemental Instructions (ASIs) that may affect systems being commissioned, or changes in the commissioning schedule. The CxA may review construction meeting minutes, change orders, RFIs or ASIs for the same purpose.

Later during construction, the CxA, through the PM, will schedule necessary meetings between various commissioning team parties as required.

4.5 Miscellaneous Management Protocols

The following protocols will be used on this project as agreed to in the scoping meeting

Issue	Protocol
For requests for information (RFI) or formal documentation requests:	The CxA goes first: ☐ directly to Sub or A/E, ☐ through the CM, ☒ through A/E to GC.
For minor or verbal information and clarifications:	The CxA goes direct to the informed party.
For notifying contractors of deficiencies:	The CxA documents deficiencies through the PM, but may discuss deficiency issues with the GC prior to notifying the PM. Copies of deficiency reports are provided to the team.
For scheduling functional tests or training:	☒ The CxA may provide input for (and do some coordination of) training and testing, but does not do any scheduling.
For scheduling commissioning meetings:	The CxA selects the date and schedules through the: ☒ PM and ☒ GC. ☐ The CxA schedules and notifies attendees directly.

For making a request for significant changes:	The CxA has no authority to issue change orders.
For making small changes in specified sequences of operations:	☒ The CxA may suggest (through the PM to the A/E for approval) changes in sequences of operations to improve efficiency or to control or correct deficiencies. A/E approved changes will be documented and forwarded to the GC for modification by the responsible subcontractor. ☒ The CxA may not make changes to specified sequences without approval from the A/E.
Subcontractors disagreeing with requests or interpretations by the CxA shall:	Try to resolve with the CxA first. Then, if necessary, work through the GC, who will work with the CxA directly or through the PM to resolve the situation.

4.6 Progress Reporting and Logs

Throughout the construction, the CxA shall conduct site visits according to Contract and provide a commissioning field report at the completion of each site visit. The PM may adjust the reporting frequency as needed. The field reports contain site observation reports, a list of new and outstanding deficiencies, and a description of Cx progress corresponding to the Cx plan. The CxA will keep a log of commissioning progress and all Cx-related issues that require current or future attention.

The CxA regularly communicates with all members of the commissioning team, keeping them apprised of issues that have been identified, commissioning progress, and scheduling through memos, progress reports, etc. The CxA will provide commissioning materials in an organized notebook, which will become part of the final commissioning report.

4.7 Initial Submittals and Documentation

4.7.1 Standard Submittals

The Subs shall provide the submittals required per specifications through the normal process for commissioned assemblies and equipment that they are responsible for installing. The PM will provide copies to the CxA concurrent with the normal A/E submittal process. In advance of the typical submittal schedule the GC and Subs will provide equipment data which will include at minimum installation and start-up procedures, O&M data, performance data, and control drawings. The CxA will review and comment to the A/E on the submissions relative to commissioning issues expressed in the contract documents, not for general contract compliance (which is the A/E's responsibility).. The CxA will provide recommendations to the A/E and PM as necessary for submittals provided for commissioned equipment, systems and assemblies. All submittal review comments by the CxA will be inputted under the appropriate submittal package in the ePM system or sent to the PM if input is not available for CxA in ePM.

These submittals to the CxA do not constitute compliance for submittals for the O&M manuals. Documentation requirements for the O&M manuals are discussed in a separate section herein.

4.7.2 Special Submittals, Notifications, and Clarifications

The Subs and A/E shall notify the CxA of any changes to equipment, the design or operating parameter changes, added control strategies and sequences of operation, or other change orders that may affect commissioned systems. The controls contractors shall provide the CxA a full points list with details requested by the CxA. Thirty (30) days prior to performing owner-contracted tests, the Subs shall provide the CxA full details of the procedures. As the phases of the TAB are completed, the draft TAB report shall be provided to the CxA with full explanations of approach, methods, results, data table legends, etc. The final TAB report will be provided to the CxA within two weeks of completion.

These submittals to the CxA do not constitute compliance for submittals for the O&M manuals. Documentation requirements for the O&M manuals are discussed in a separate section herein.

The CxA may request additional design narrative from the A/E and from the controls contractor depending on how complete the documentation provided is in the contract documents. The CxA may submit written questions through Technical Memos that are entered into the issues log and tracked until they are addressed or clarified by the responsible party, as needed.

4.7.3 Mock-Up Reviews and Testing

The Subs and A/E shall notify the CxA ten (10) days in advance of completion of system mockups to allow the CxA to be onsite for a review of the mockup. The CxA may review selected system mockups and provide comments as necessary through a field report to the construction team and owner. The CxA reserves the right to observe selected testing of the system mockups as part of their review to observe material interfacing and general performance of the system based upon criteria set in the OPR and construction documentation. Mock-up review and testing is

4.8 Construction Checklists, Tests and Start-up

Construction checklists (CK) are important to ensure that the assemblies, equipment and systems are installed per specifications. CKs are filled-out weekly by the contractor's field supervisors and start-up technicians who have direct knowledge of the work. The CK provides valuable information to the construction management team in assessing the progress of work and allows easy identification of potential problem areas and contractor work coordination issues allowing teams to focus on scheduling, materials, and man power issues.

The filled-out CKs are submitted with the payment application each month. CKs received by the PM are forwarded to CxA who consolidates the information tracking project progress. During the CxA's scheduled site visit the CxA will verify the information contained in the CKs received by the contractors on a random basis. Items checked by the contractors which are inaccurate will be identified by the CxA, brought to the team attention, entered into the issues log, and require re-verification by the CxA.

The contractor responsible for the deficiency will notify the GC when the issue has been corrected. The GC will update the issues log to notify the CxA that the contractor is ready for re-verification during a scheduled site visit by the CxA. Issues identified as corrected by the GC but when re-verified by the CxA are found to have not been corrected will result in a back-charge to the responsible contractor.

Each piece of equipment will receive a full checkout by the Contractor who reports these checkouts on the CK. No sampling strategies are used. In general, the CK testing for a given system must be

successfully completed prior to formal functional performance testing of equipment or subsystems of a given system.

CKs are primarily static inspections and procedures to prepare the equipment or system for initial operation (e.g., oil levels OK, fan belt tension, labels affixed, gages in place, sensor calibration, etc.). However, some construction checklist items entail simple testing of the function of a component, a piece of equipment or system (such as measuring the voltage imbalance on a three phase pump motor of a chiller system). The CKs augment and are combined with the manufacturer's start-up checklist.

Contractors typically already perform some, if not many, of the CK items the commissioning process requires. However, few contractors document in writing the execution of these checklist items. This project requires that the procedures be documented in writing by the installing technician. The CxA does not typically witness the contractor completing the CKs, except for testing of larger or more critical pieces of equipment but does conduct random verification that the items in the CK have been fully checked by the installing contractor.

4.8.1 Start-up Plan

The CxA will review the start-up plan developed by the mechanical and electrical contractors which will detail start-up for all HVAC equipment and emergency generator if installed. The plan will include what equipment will be placed into operation, a copy of the factory start-up procedure, how the equipment is being protected in accordance with the construction IAQ management plan, and who will be conducting the equipment start-up. Plans will be submitted to the CxA (4) four weeks prior to the scheduled equipment start-up for CxA review and approval through the GC to the PM. When the consolidated CKs indicate that the contractors have completed all of the items contained in their CK, the CxA will forward the consolidated CK along with the approved start-up plan to the GC to obtain signatures from each responsible contractor indicating that the equipment is ready for start-up.

The following procedures will be used for this project: (the Sub is responsible for the Plan development):

1. The CxA develops construction checklists (CK) and procedures for equipment and assemblies listed in Specification Section 019100.
2. The CxA provides checklists to the subs as part of Secification section 019100.
3. The Sub designated to develop the Start-up Plan identifies which equipment is to be started by equipment tag designation; indicates which construction IAQ management procedures will be implemented; obtains manufacturer installation, start-up and checkout data, including actual field checkout sheets used by the field technicians and provides copies in their start-up plan submission to the CxA through the GC and PM. This submission along with copied pages from item (4), become the "Start-up and Checkout Plan."
4. The Sub copies all pages with important instructional data and procedures (not covered in manufacturer field checkout sheets) from the start-up and checkout manuals and adds a signature line in the column by each procedure.
5. For systems that may not have adequate manufacturer start-up and checkout procedures, particularly for components being integrated with other equipment, the Sub should provide the added necessary detail and documentation format to the CxA for approval, prior to execution.
6. The Sub transmits the full Start-up Plan to the CxA for review and approval.
7. The CxA reviews and approves the procedures noting any procedures that need to be added, and conveys them to the GC. The GC then transmits the full start-up plan to the Subs for their review and use. (This usually means that the Consolidated CK, alone, will go to more than one Sub, while the full plan will go to start-up technician of the primary installing contractor.)

4.8.2 Execution of Checklists and Start-up

Four (4) weeks prior to startup, the Subs and vendors will schedule start-up and initial checkout with the GC and CxA. The startup and initial checkout are directed and executed by the Sub or vendor. The CxA, assisted by selected facility staff and the PM if necessary, may observe selected equipment start-ups. For the USDC museum this may include the air handling unit, energy recovery unit, fan coil unit, and computer room air conditioning unit. For components of equipment (e.g., mixing dampers), the CxA, assisted by selected facility staff, may observe random samples of CK and start-up procedures.

To document the process of startup and checkout, the site technician performing the line item task will initial and date each paragraph of procedures in the "Startup Plan" and check off items on the manufacturer field checkout sheets, as they are completed. Only individuals having direct knowledge of a line item being completed shall check or initial the forms.

The Subs and vendors will execute the checklists and tests and submit a signed copy of the completed startup and CKs to the CxA indicating that the system is ready for functional testing. Further details are found in the Specification Section 019100. The CxA will verify Cx in progress, as necessary. The checklists may be passed around to the Subs to fill out, as all contain more than one trade's responsibility. The CxA or owner's representative will conduct spot-checking of completed forms and consolidation of information.

4.8.3 Sampling Strategy for CxA Observation of Construction Checkout and Startup

The following table provides a tentative list of the equipment and how much of the pre-functional checkout and startup work may be witnessed by the CxA.

Equipment or System	Fraction or Percentage that may be observed by CxA
☒ Air Handling Unit	100%
☒ Fan Coil Unit	100%
☒ Mixing Dampers	100% of the units
☒ Major Duct Flow and Pressure Checks	100% of temperature, pressure or flow readings
☒ Computer Room Air Conditioning Unit	100%
☒ Fire/Smoke Damper Installation and Operation	100%
☒ Fan and Motor Performance	100%
☒ Energy Recovery Unit	100%
☒ VAV Terminal Units	100%
☒ HVAC System Controls	100% of sensor readings and calibrations, adjustable set points, monitoring points & graphics, and identifications per CDs.

☒ Domestic Water System	100% of water heater operation
☒ Interior Lighting Controls	100%
☒ Dimming System	100%
☒ Exterior Lighting Controls	100%
☒ HVAC Pipe Freeze Protection	100%

4.8.4 Deficiencies and Non-Conformance

The Subs shall clearly list any outstanding items of the initial startup and procedures that were not completed successfully at the bottom of the procedures form or on an attached sheet. The procedures form and deficiencies shall be provided to the CxA within Seven (7) days of test completion. The CxA will work with the Subs and vendors to correct and retest deficiencies or uncompleted items, involving the A/E and others as necessary. The installing Subs or vendors will correct all areas that are deficient or incomplete according to the checklists and tests. The CxA recommends approval of the startup and initial checkout of each system to the A/E.

4.8.5 TAB

The TAB contractor will submit the outline of the TAB plan and approach to the CxA and the CC eight (8) weeks prior to starting the TAB. Included in the approach is an explanation of the intended use of the building control system. The CxA will review the plan and approach for understanding and coordination issues and may comment, but does not "approve". The CxA will schedule a go-to-meeting with the TAB and controls technicians to confirm that the TAB technician understands the TAB commissioning process. The controls contractor reviews the feasibility of using the building control system for assistance in the TAB work. A checklist form for reviewing the TAB plan is provided by CxA as one of the construction checklists. On completion of the TAB work, a preliminary copy of the TAB report will be provided to the CxA for review. Upon completion of the review, the CxA will schedule a site visit with the TAB contractor to perform a verification of no less than 10% of the TAB report values.

4.8.6 Controls Checkout Plan

Three (3) weeks before beginning checkout, the CC develops and submits a written step-by-step plan to the CxA which describes the process they intend to follow in checking out the control system and the forms on which they will document the process. The CC will also meet with the TAB contractor prior to the start of TAB and review the TAB plan to determine the capabilities of the control system for use in TAB. The CC will provide the TAB contractor with any necessary unique instruments as necessary and instruct the TAB contractor in their use (handheld control system interface for use around the building during TAB, etc.) The CC shall also provide a technician qualified to operate the controls to assist the TABC in performing TAB.

All CxA-required controls PCs, calibrations, start-up and selected functional tests of the system shall be completed and approved by the CxA prior to TAB. The CC shall execute the tests and trend logs assigned to them in Section 220800 and 230800 and remain onsite for assistance with mechanical system functional tests as specified in the same sections.

4.9 Development of Commissioning Test and Verification Procedures

4.9.1 Overview

Commissioning testing is the dynamic testing of assemblies and systems (rather than just components) under full operation (e.g., the chiller pump is tested interactively with the chiller functions to see if the pump ramps up and down to maintain the differential pressure set point). Systems are tested under various modes, such as during low cooling or heating loads, high loads, component failures, unoccupied, varying outside air temperatures, fire alarm, power failure, etc. The systems are run through all of the control system's sequences of operation and components are verified to be responding as the sequences state. The CxA develops the commissioning test procedures in a sequential written form and coordinates, oversees, and documents the actual testing, which is usually performed by the installing contractor or vendor.

4.9.2 Scoping of Testing

Commissioning test procedures provide specific functional testing for each piece of commissioned equipment. The Specification "Testing Requirements" Sections 070700, 080800, 230800, 220800, and 260800 provide specific functional testing scopes for the commissioned equipment. If specific testing requirements were not included in the bid documents and original specifications, they should be developed for this project for each piece of commissioned equipment.

4.9.3 Development Process

Before test procedures are written, the CxA obtains all requested documentation and a current list of change orders affecting equipment or systems, including an updated points list, control sequences and setpoints. The CxA will develop (with the Subs) specific test procedures to verify proper operation of each piece of equipment and system, using the testing requirements in the Specification Sections 230800, 220800, and 260800. The CxA will obtain clarification, as needed, from contractors and the A/E regarding sequences and operation to develop these tests. Prior to execution, the CxA will provide a copy of the primary equipment tests to the installing Sub (via the GC) who will review the tests for feasibility, safety, warranty, and equipment protection.

Commissioning testing and verification may be achieved by manual testing (persons manipulate the equipment and observe performance) or by monitoring the performance and analyzing the results using the control system's trend log capabilities or by stand-alone data loggers. The CxA follows the specifications when given and uses judgment where needed to determine which method is most appropriate. According to the specifications, not all pieces of identical equipment receive in-depth testing. The CxA reviews owner-contracted, factory or required owner acceptance tests and determines what further testing may be required to comply with Specifications. Redundancy is minimized.

All testing procedures for building enclosure testing are located in Specifications Sections 070700 and 080800.

4.10 Execution of Commissioning Testing Procedures

4.10.1 Overview and Process

For any given system, prior to performing commissioning testing, the CxA waits until the construction checklist has been submitted with the necessary signatures, confirming that the system is ready for functional testing. After the CxA reviews and approves the Construction checklist forms filled out during start-up by the contractor, the contractor can schedule the commissioning testing. The CxA will oversee, witness, and document the functional testing of all equipment and systems according to the Specifications and the Cx Plan. The Subs will execute the tests. The control system is tested before it is used to verify performance of other components or systems. The air balancing and water balancing is completed and debugged before functional testing of air-related or water-related equipment or systems. Testing proceeds from components to subsystems to systems and finally to interlocks and connections between systems.

4.10.2 Deficiencies and Retesting

The CxA documents the results of the test. Corrections of minor deficiencies that have been identified are made during the tests at the discretion of the CxA. The CxA records the results of the test on the procedure or test form. Deficiencies or non-conformance issues will be noted and reported to the A/E. Subs will correct deficiencies and notify the CxA in writing certifying correction. The CxA will schedule retesting through the GC. Decisions regarding deficiencies and corrections will be made at as low a level as possible, preferably between CxA or A/E and the Sub. For areas in dispute, final authority, besides the Owner's, resides with the A/E. The CxA recommends acceptance of each test to the A/E.

4.10.3 Facility Staff Participation

The Owner's facilities operating staff are encouraged to attend and participate in the testing process. The CxA will notify the PM, who will then notify the facility staff when the commissioning events will occur. Witnessing the performance testing provides valuable training on the system operating sequences and more importantly the interaction between systems.

4.10.4 Sampling

No sampling will occur.

4.11 O&M Manuals and Warranties

4.11.1 Standard O&M Manuals

The CxA will review the O&M manuals, documentation and redlined as-builts for systems that were commissioned to verify compliance with the Specifications. The CxA will recommend approval and acceptance of these sections of the O&M manuals to the A/E. The CxA will also review each equipment warranty and verify that all requirements to keep the warranty valid are clearly stated.

4.12 Training and Orientation of Owner Personnel

Owner training and orientation on equipment and systems provided by the Contractor is accomplished in three general steps using three forms:

4.12.1 Overall Plan

After reviewing the specifications, and after interviewing facility staff, if necessary, the Owner and Commissioning Authority (CxA) will fill out a table listing all the equipment for which training or orientation will be provided. This form lists, among other things, the type and number of trainees, the rigor of training desired by the Owner, the primary responsible subcontractor, the trainer's company and columns for tracking training agendas. The Commissioning Authority will provide this form to the Contractor for reference.

4.12.2 Specific Training Agendas

For each piece of equipment or system for which training is provided, the CxA will develop a form for including in the training session contractors / trainers from different disciplines, when appropriate, by listing their company names in the form. In particular, the controls contractor will provide brief training on controls in the same session with the mechanical training for equipment controlled by the building automation system.

This form is then submitted to the Contractor who has the trainer fill out the rest of the Sections on the form, describing the subjects covered, the duration of each subject and the methods that will be used in the training, along with the name and qualifications of the trainer(s). The trainer returns this form to the Contractor, who submits it to the Owner and CxA. The Owner and CxA will review the agenda; make comments; approve the form subject to the comments; and submit the form back to the Contractor. The Contractor provides the approved agenda to the trainer to use during the training. The trainer then provides a copy of the agenda to each trainee.

4.12.3 Training Record

The CxA may witness the training sessions. The Training Record form will be provided by the CxA. The trainer signs for the session and obtains the signature of each trainee. The trainer also checks off subjects covered on the agenda. When the training is complete, the Contractor will provide a copy of the training record and training agenda to the Owner and CxA.

4.13 Warranty Period

During the warranty period, seasonal testing and other deferred testing that are required will be completed according to the Specifications. The CxA coordinates this activity. Tests will be executed and deficiencies corrected by the appropriate Subs, witnessed by facilities staff and the CxA. Any final adjustments to the O&M manuals and as-builts due to the testing will be made. In addition the

CxA will return to the project approximately 10 months into the 12 month warranty period. During this visit(s) the CxA will review with facility staff the current building operation and the condition of outstanding issues related to the original and seasonal commissioning. The CxA will also interview facility staff and identify problems or concerns they have operating the building as originally intended. The CxA will make suggestions for improvements and for recording these changes in the O&M manuals. The CxA will identify areas that may come under warranty or under the original construction contract. The CxA will also assist facility staff in developing reports and documents and requests for services to remedy outstanding problems.

SECTION 5

Written Work Products

5.1 Commissioning Systems Manual

A final commissioning systems manual will be provided to the PM after substantial completion of the project. The systems manual shall include the following:

1. *Executive Summary*

   An overall description of the building and its systems, significant activities completed during commissioning, reference to any outstanding issues, and description of contents of the systems manual

2. *Recommendations*

   A list of recommendations from the CxA to the owner for increasing energy efficiency, reducing maintenance issues, ongoing optimization of building performance, etc. This list will also contain schedule of maintenance requirements, retesting of commissioned systems, and calibration of sensors.

3. *Project Team*

   List of contractors, subcontractors, architects, engineers, owner's representatives, etc. and their contact information

4. *Owner's Project Requirements*

   Written document that details the requirements of the project and the expectations of how it will be used. Includes benchmarks, measurable performance criteria, success criteria, etc.

5. *Basis of Design*

   Document that records the concepts, calculations, decisions, and product selections used to meet the Owner's Project Requirements and to satisfy applicable regulatory requirements.

6. *Design Review*

   Document that includes issues from commissioning review of design documents. This document includes comments from designers on how issues are resolved.

7. *Submittal Review Log*

   Document that includes issues from the commissioning review of the submittal documents. This document includes comments from designers on how issues are resolved.

8. *Field Reports*

   Reports which document the observations of the CxA during site visits. Issues from these reports are also contained in the issues log.

9. *Issues Log*

A formal and ongoing record of issues and concerns and their resolutions that have been raised by the CxA during the Commissioning Process

10. *Completed Testing Forms*

    Completed forms documenting the compliance or failure of building systems during performance testing.

11. *Completed Training Forms*

    Completed forms documenting training agendas and individuals receiving training

12. *Completed Construction Checklists*

    Completed checklists from the contractors

13. *Single Line Drawings and Sequences of Operation*

    Single line drawings for entire system and final sequence of operation including final set points.

14. *Other*

    All documentation deemed necessary for inclusion in the systems manual that does not fall into previous categories (trend logs, monitoring reports, meeting minutes, etc.).

SECTION 6

Schedule

6.1 General Issues

The following sequential priorities are followed:

1. Equipment is not "temporarily" started (for heating or cooling), until pre-start checklist items and all manufacturers' pre-start procedures are completed and moisture, dust and other environmental and building integrity issues have been addressed.
2. Commissioning testing is not begun until construction checklists and start-up and TAB is completed, for a given system.
3. The controls system and equipment it controls are not tested until all points have been calibrated and pre-commissioning testing completed.
4. TAB is not performed until the controls system has been sufficiently tested and approved by the CxA for TAB work.
5. TAB is not performed until the envelope is completely enclosed and ceiling complete, unless the return is ducted.

6.2 Project Schedule

The initial commissioning schedule is summarized in the table below.

Task / Activity		Estimated Start Date	Estimated End Date
Scoping meeting and final plan		October 2014	October 2014
Submittals obtained and reviewed		July 2014	October 2014
Begin construction site visits/inspections		November 2014	November 2015
Construction Checklists developed and distributed			
Start-up and initial checkout plans		April 2015	May 2015
Start-up and initial checkout executed		June 2015	July 2015
TAB:	Water	July 2015	July 2015
	Air	September 2015	September 2015
Functional performance tests		September 2015	September 2015
O&M documentation review and verification		September 2015	September 2015
Training and training verification		September 2015	October 2015
Final commissioning report		November 2015	December 2015
Seasonal testing		TBD if needed	TBD if needed

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APPENDIX 1

PROJECT TRAINING AND ORIENTATION PROCEDURE

Owner training and orientation on equipment and systems provided by the Contractor is accomplished in three general steps using three forms.

1. Overall Plan. After reviewing the specifications, the Owner and Commissioning Authority (CxA) fill out a table listing all the equipment that will have training or orientation provided for, on Form C-5a, *Project Training Plan--General Scope and Responsible Parties*. This form lists, among other things, the trainee type and number, rigor of desired training by the Owner, the primary responsible subcontractor, the trainer's company and columns for tracking training agendas. The Commissioning Authority provides this form to the Contractor for reference.

2. Specific Training Agendas. For each piece of equipment or system being trained on, the Owner and CxA fill out Section 1 of the *Training and Orientation Agenda*, Form C-5b. This section includes some of the information from Form C-5a regarding the scope of training and the intended audience, for reference by the trainer in developing their training agenda. The CxA develops a plan for including in the training session contractors / trainers from different disciplines, when appropriate, by listing their company names in Section 2 of the form. In particular, the controls contractor will provide brief training on controls, in the same session with the mechanical training for equipment controlled by the building automation system.

   This form is then submitted to the Contractor who has their trainer fill out the rest of Section 2 and 3 of the form (Form C-5b), describing the subjects covered, duration of each subject and the methods that will be used in the training, along with the name and qualifications of the trainer(s). The trainer returns this form to the Contractor, who submits it to the Owner and CxA. The Owner and CxA review the agenda; make comments; approve subject to the comments; and submit back to the Contractor. The Contractor provides the approved agenda to the trainer to use during the training. The trainer provides a copy of the agenda to each trainee.

3. Training Record. For each piece of equipment, prior to training, the Contractor provides to their trainer(s) Form C-5c, *Training and Orientation Record*. On this form, the trainer documents each training session (duration and general subjects covered). The trainer signs for the session and obtains the signature of each trainee. The trainer also checks off subjects covered on their Agenda (Form C-5b). When the training is complete, the Contractor provides a copy of the *Training and Orientation Record,* Form C-5c, and the trainer's Agenda, Form C-5b. The Owner and CxA review C-5c and make final approval by signing it. The CxA may witness any of the training sessions.

OVERALL STAFF TRAINING AND ORIENTATION PLAN

Form C-5a

Project: _____ Date: Prepared by:

(To be filled out by the Commissioning Authority in consultation with the Owner)

Equipment / System	Spec Section	Total Hours (if spec'd)	Scope Code[5]	Trainee Type[6] (list no. of ea.)	Primary Responsible Contractor	Trainers' Company	Agenda Recv'd?	Planned Training Date(s)
Mechanical / HVAC								
Electrical								

Equipment / System	Spec Section	Total Hours (if spec'd)	Scope Code[5]	Trainee Type[6] (list no. of ea.)	Primary Responsible Contractor	Trainers' Company	Agenda Recv'd?	Planned Training Date(s)
Re-Commissioning[1]								
Architect[2]								
Mechanical Designer[3]								
Electrical Designer[4]								

[1]**Recommissioning.** The Commissioning Authority will provide instruction on the use of blank functional test forms for periodic re-commissioning of equipment and systems, per the specification.
[2]**Architect.** The architect will provide a general overview of the facility, its use, special features, tenant and public considerations, etc.
[3]**Mechanical Design Engineer.** The mechanical designer will provide an overview of the major systems and equipment in the facility, including for each system: the design intent, why the system was chosen, an overview of its operation, and interactions with other systems, any special areas to be aware of, issues regarding future expansion and remodeling, etc.
[4]**Electrical Design Engineer.** The electrical designer will provide an overview of the major electrical systems and equipment in the facility, particularly the lighting control systems, fire alarm, security and emergency power, focusing on the design intent, why the system was chosen, an overview of its operation, and interactions with other systems, any special areas to be aware of, issues regarding future expansion and remodeling, etc.
[5]**General Scope Codes** (refer to the specifications and to the specific equipment Training Agenda for additional details)

A Provide an ***overview*** of the purpose and operation of this equipment, including required interactions of trainees with the equipment.

B At an ***intermediate level***, provide technical information regarding the purpose, operation and maintenance of this equipment, expecting that serious malfunctions will be addressed by factory reps.

C At a ***very technical level,*** provide information regarding the purpose, operation, troubleshooting and maintenance of this equipment, expecting that almost all operation, service and repair will be provided by the trainees.

[6]**Trainee Types**

FM = facility manager, FE = facility engineer and assistants, FT = facility technician / maintenance,
PM = project manager, T = tenants, O = other

*OSCI = Owner supplied, contractor installed

TRAINING AND ORIENTATION AGENDA

Form C-5b

Project:_____ Date:

Equipment / System:_____ Spec Section:

Section 1. Audience and General Scope

[Owner and Commissioning Authority fill out this section and transmit entire form to responsible contractors. Attach training specification section.

Intended audience type (enter number of staff): facility manager, facility engineer, facility technician, project manager, tenant, other:

General objectives and scope of training: (check all that apply)

A. Provide an overview of the purpose and operation of this equipment, including required interactions of trainees with the equipment.

B. Provide technical information regarding the purpose, operation and maintenance of this equipment at an intermediate level, expecting that serious malfunctions will be addressed by factory reps.

C. Provide technical information regarding the purpose, operation, troubleshooting and maintenance of this equipment at a very detailed level, expecting that almost all operation, service and repair will be provided by the trainees.

Section 2. Instructors

[Commissioning Authority fills in Company. Trainer fills out the balance, prior to training.]

ID	Trainer	Company	Position / Qualifications
1)			
2)			
3)			

Section 3. Agenda

[The responsible contractors have their trainers fill out this section and submit to Owner and Commissioning Authority for review and approval prior to conducting training.]

Location: site Date

classroom (location) ,

Date

Agenda of general subjects covered (√ all that will be covered)	Completed (√ when completed)	Duration (min.)	Instructor (ID)
(√) General purpose of this system or equipment (design intent)			
Review of control drawings and schematics (have copies for attendees)			

Startup, loading, normal operation, unloading, shutdown, unoccupied operation, seasonal changeover, etc., as applicable

Integral controls (packaged): programming, troubleshooting, alarms, manual operation

Building automation controls (BAS): programming, troubleshooting, alarms, manual operation, interface with integral controls

Interactions with other systems, operation during power outage and fire

Relevant health and safety issues and concerns and special safety features

Energy conserving operation and strategies

Any special issues to maintain warranty

Common troubleshooting issues and methods, control system warnings and error messages, including using the control system for diagnostics

Special requirements of tenants for this equipment's function

Service, maintenance, and preventative maintenance (sources, spare parts inventory, special tools, etc.)

Question and answer period

Other subjects covered, specific to the equipment: **Duration** **Instructor** **Completed**

Total duration of training (hrs) ----------> ☐

Training methods that will be included (clarify as needed): (Trainer checks all that apply)

_√_ use of the O&M manuals, illustrating where the verbal training information is found in writing

_√_ each attendee will be provided: 1) the control drawing schematic and sequence of operations; 2) a copy of this agenda.

_√_ discussion/lecture at site

_√_ site demonstration of equipment operation

written handouts
manufacturer training manuals
classroom lecture
classroom hands-on equipment
video presentation
__√__ question and answer period

Section 4. Approvals and Use *[Once the Agenda has been filled out by the Trainer, the Owner and Commissioning Authority review, make edits, sign and return to Contractor who provides to the Trainer for use during training. Copies of Agenda shall be provided to trainees.]*

This *plan* has been approved by the following individuals, subject to the additions and clarifications noted in the left columns marked "add." *(This is not an approval of training completion.)*

Owner's Representative Date

Commissioning Authority Date

STAFF TRAINING AND ORIENTATION RECORD

Form C-5c

Project:_____ Date: Prepared by:

System or Equipment: _____

TraineeSignature[2] and Position	Total Req'd Hrs[1]	Hrs Done	Training Date	General Topics Covered	Trainer Signature & Company	CA Initials
1.						
2.						
3.						
4.						

[1]The hours of required training have been filled out from the *Specifications*. Refer to the *Specifications* for additional details regarding the training requirements.

[2]Trainee signs after the training session is completed.

Notes attached. (Y/N)

Final Approval of Training Completion

According to the Contract Documents:

Owners Rep	Date	Cx Authority	Date

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APPENDIX 2

Document and Test Development
Flow Charts and Submittal Maps

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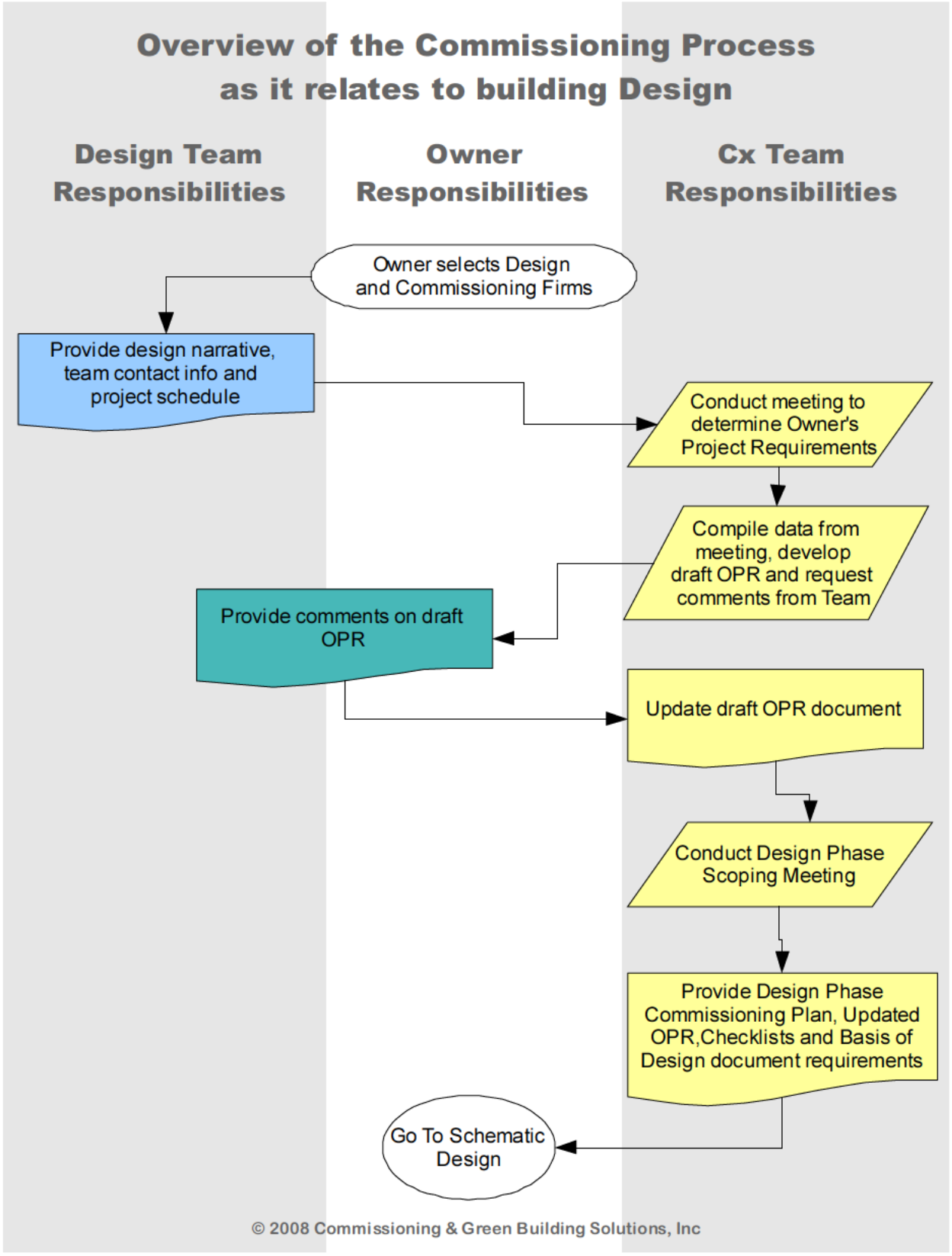
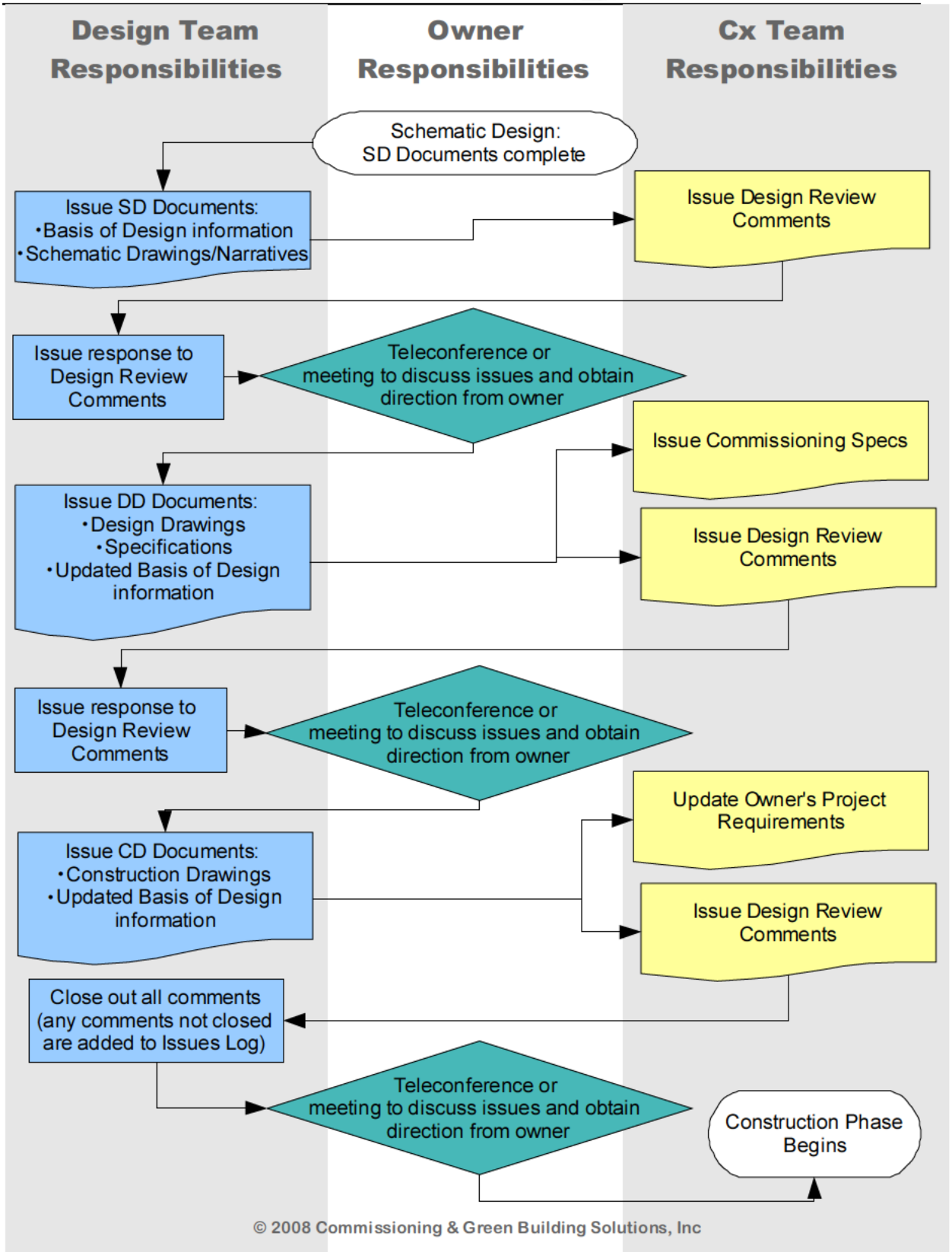
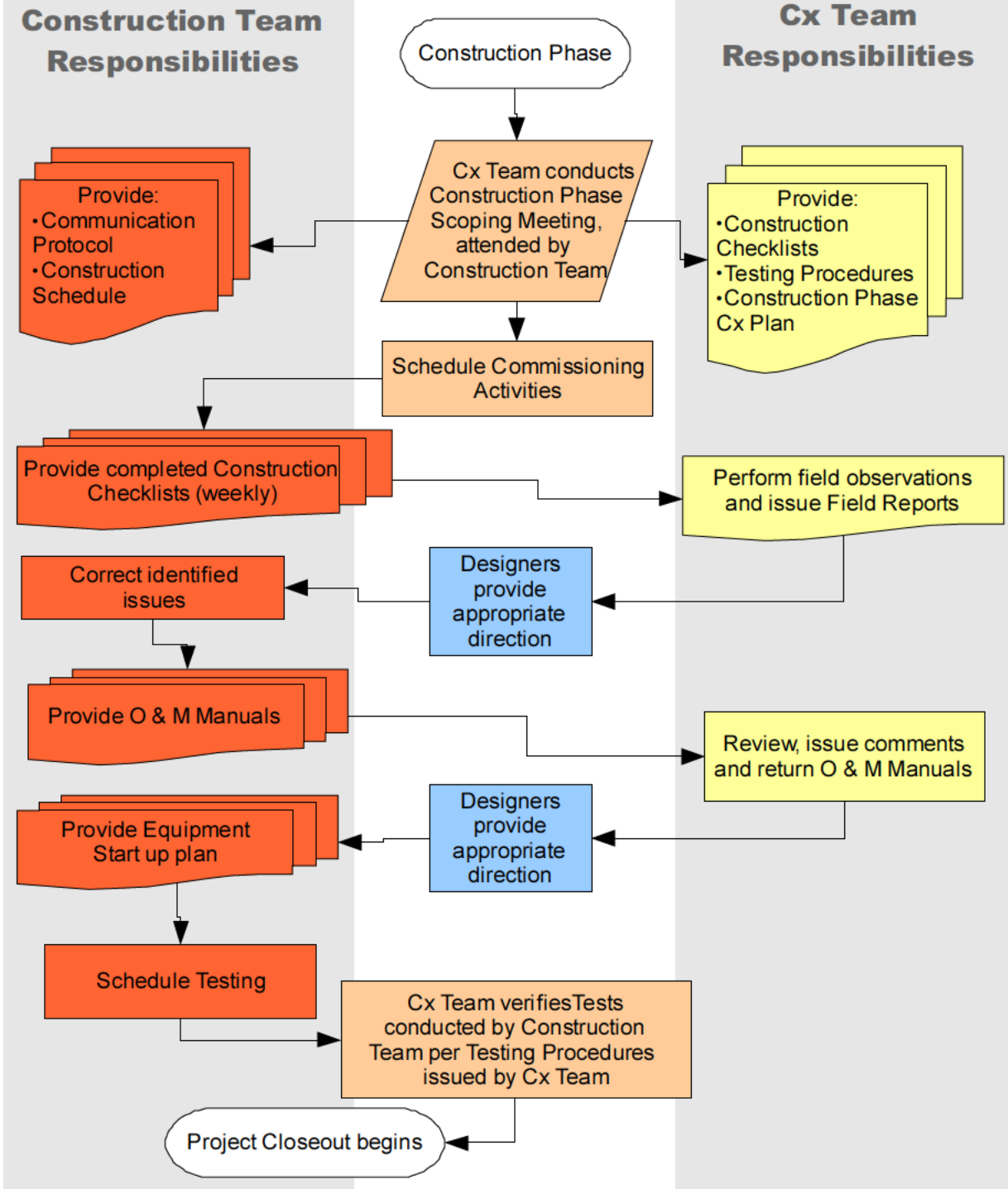
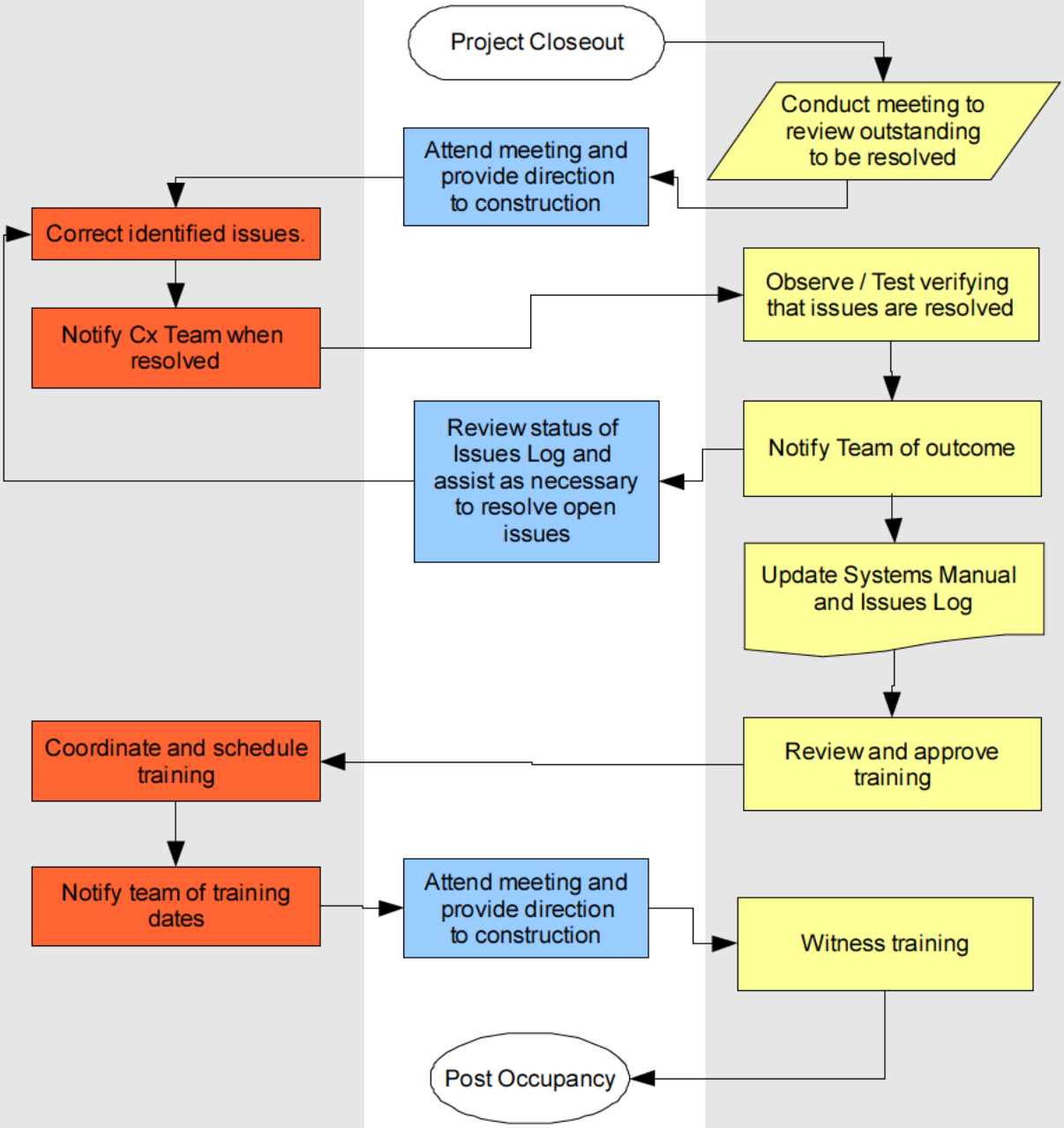

Overview of the Commissioning Process as it relates to building Design
Design Team Responsibilities
Owner Responsibilities
Cx Team Responsibilities
Owner selects Design and Commissioning Firms
Provide design narrative, team contact info and project schedule
Conduct meeting to determine Owner's Project Requirements
Compile data from meeting, develop draft OPR and request comments from Team
Provide comments on draft OPR
Update draft OPR document
Conduct Design Phase Scoping Meeting
Provide Design Phase Commissioning Plan, Updated OPR,Checklists and Basis of Design document requirements
Go To Schematic Design
© 2008 Commissioning & Green Building Solutions, Inc


Design Team Responsibilities
Owner Responsibilities
Cx Team Responsibilities
Schematic Design: SD Documents complete
Issue SD Documents: •Basis of Design information •Schematic Drawings/Narratives
Issue Design Review Comments
Issue response to Design Review Comments
Teleconference or meeting to discuss issues and obtain direction from owner
Issue Commissioning Specs
Issue DD Documents: •Design Drawings •Specifications •Updated Basis of Design information
Issue Design Review Comments
Issue response to Design Review Comments
Teleconference or meeting to discuss issues and obtain direction from owner
Update Owner's Project Requirements
Issue CD Documents: •Construction Drawings •Updated Basis of Design information
Issue Design Review Comments
Close out all comments (any comments not closed are added to Issues Log)
Teleconference or meeting to discuss issues and obtain direction from owner
Construction Phase Begins
© 2008 Commissioning & Green Building Solutions, Inc

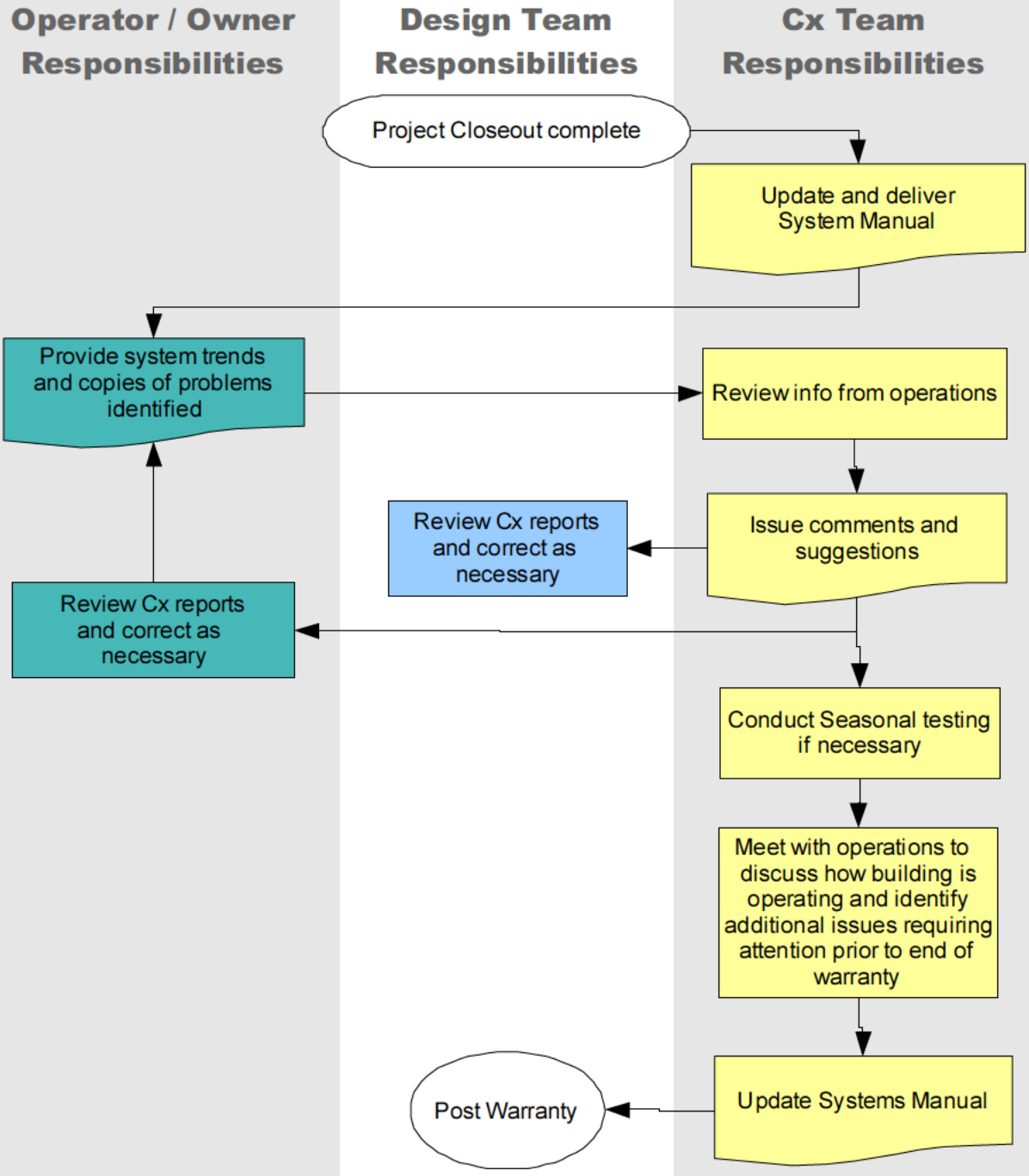
Overview of the Commissioning Process as it relates to building Construction



Overview of the Commissioning Process as it relates to Project Closeout



Overview of the Commissioning Process as it relates to Post Occupancy / Warranty period



CXGBS 100% Review Comments

Discipline to Respond	Comment #	Reference	Comment	CXGBS Recommended Action	Response
BBB/GSX	G1	Lighting Design	No LEED credits would be due this project for night time lighting. A significant amount of light would be directed toward the sky from the glass roof.		The design team has updated the LEED scorecard to reflect that this LEED credit is not being pursued. Exterior lighting is provided to accent light the historic façade as well as the Entry Pavilion facades with sources that employ highly controlled optics. Luminaires are shielded to prevent light trespass and project light onto surfaces that require it rather than inefficiently putting light into the sky. More than 10% of the total initial designed site lumens are emitted at an angle of 90 degrees or height from nadir, and therefore, the SS Credit 8 can not be achieved on this project.
BBB	A1	A1.11, A1.12	Lower Level RCP 2 1'x4' emergency light fixtures in elevator shaft interfere with elevator movement	Recommend proper placement of elevator shaft light fixtures on Main Level RCP	The lights are correctly placed as they are in the elevator pit below the elevator. We will add notes to help explain their placement. The lights will also be referenced in the sections on sheet A7.11.
BBB	A10	1/A3.02, 3/A3.02	In Section 1 the exterior grade is about 41'-6 ½" where the section is cut and in Section 3 the exterior grade is about 39'-4 ¾" where the section is cut, a difference of over 2'. Neither section shows the exterior grades accurately.		BBB will update these sections in the Bid Set Submission.
BBB	A21	Architectural drawings and specifications	Amount of visual light transmittance (VLT) from large amount of glazing on roof may cause washout of exhibits and presentations in pavilion.	Review amount of VLT and amount of clear glazing on roof and provide documentation to show washout will not occur.	Currently the area of skylight glass that allows light into the pavilion is 49% of the overall Entry Pavilion roof design. This glazing has been significantly modified from our 65% submission and is composed of an IGU that has a 80% frit and exterior low E reflective coating to reduce VLT to 16%. The exhibit designers are currently designing for the given level of VLT and are compensating for it by screen placement and screens lumens output. Additional information related to this topic will be provided in the response to the CXGBS Technical Memo dated 04.12.12.

BBB	A23	1/A1.22	Roof drains are located along column line P1 but no maintenance grating is shown – how are these drains to be serviced without walking on the glazing surfaces?	Consider adding maintenance grating	The glazing surface has been designed to be able to support the load of maintenance staff and can be walked on as confirmed by the glazing manufacturer. The primary function of the grating is for Fall Restraint attachment which maintenance staff will be required to tie back to when on the roof per OSHA. Additional grating has been added to allow increased circulation. The grating does rotate up to be able to access drains. Additional information related to this topic will be provided in the response to the CXGBS Technical Memo dated 04.12.12.
BBB	A24	1/A4.07; 2/A4.07	Reference is made to refer to sheet A4.05 for Stair C details which appears to be incorrect	Sheet A7.05 has Stair C details	BBB will update and correct this reference for the Bid Set Submission.
BBB	A25	2/A4.08	No information is shown for sealing the joint between the existing wall on the left and the new construction	Add detail or reference	BBB will update this detail for the Bid Set Submission.
BBB	A26	1/A4.30	An assembly of stainless steel members make up the base of the curtain wall but it is not clear how the members are to be attached to each other. If not continuously welded or otherwise sealed there is a potential for moisture to bypass the waterproofing	Define the nature of the attachment of the steel members	The typical base detail has been updated subsequent to the 100% submission with a non-metallic shim (thermal break) that is screw fastened to the rest of the assembly to address this issue.
BBB	A27	2/A4.31	A single layer roof glazing is shown under the cat walk but not identified	Add note to identify element	The material in this area is metal panel and will be noted in the Bid Set Submission as such.
BBB	A28	2/A4.32	The roof drains are shown to be recessed into the parapet wall but the recess is not dimensioned	Add dimensions of recess pocket	BBB will add dimensions for Bid Set Submission.
BBB	A29	4/A4.35	The gutter pan is noted to aluminum but in all other details the gutter pan is noted to be stainless steel		The gutter should be stainless steel and will be updated to reflect this in the Bid Set Submission.
BBB	A30	Lobby Daylighting	Glazing type is as previously envisioned in DD, a single layer laminated glass with fritted interior surface.	If this is not correct, please indicate otherwise.	The glazing type for the skylight area of the Entry Pavilion is 1-5/16" clear fritted laminated IGU, VRE1-46. For more information please see Specifications 088 000-10. The IGU makeup is described under F.3. IGU-3.

BBB	A31	Lobby Daylighting	Based on this solution, emphasis on the visibility of the façade of the existing building from inside the space outweighs energy and environmental criteria for the addition. It also apparently outweighs the comfort and functionality of the space for some of the VDT displays during times of direct sunlight.	Without diffusion of direct sunlight, contrast between sunlit and shaded areas will make for less than ideal viewing of VDT displays.	The area of skylight glass that allows light into the pavilion is 49% of the overall Entry Pavilion roof design. This glazing has been significantly modified from our 65% submission and is composed of an IGU that has a 80% frit and exterior low E reflective coating to reduce VLT to 16%. The IGU U value in the winter is .29 and the summer is .26 which translated to a pretty efficient glass. The Pavilion is also shaded by the existing building. The mechanical engineer has provided calculations indicating the environmental performance of the space. The system is designed to maintain a temperature of 75 degrees with 50% relative humidity in the summer and 70 digress with a 30% relative humidity. These values fall within the ASHRAE Standard 55 comfort range. As for the energy performance, the modeling resulted in an 18% energy cost savings above and beyond the ASHRAI baseline. The exhibit designers are currently designing for the given level of VLT and are compensating for it by screen placement and screens lumens output. Additional information related to this topic will be provided in the response to the CXGBS Technical Memo dated 04.12.12.
BBB	A32	Lobby Daylighting	Lobby skylight.	For days with direct sunlight, I would like to see a secondary layer of movable solar shading material suspended below the roof glazing to increase comfort for users in the space. This solution would not, however, help reduce excessive heat gain in the space.	Again, the skylight glass has an 80% frit with a reflective low e coating that will significantly reduce direct sunlight transmittance. The capacity of the system represented was designed to cool the amount of heat gain within the space. Additional information related to this topic will be provided in the response to the CXGBS Technical Memo dated 04.12.12.

BBB	A33	Architectural Floor Plans	It does not appear that a vestibule has been included to meet the ASHRAE 90.1-2007 mandatory provision 5.4.3.4.	Review mandatory provision and make design modifications as necessary.	BBB has created a memo stating that we believe do to exception A and B for ASHRAE 90.1-2007 provision 5.4.3.4. we do not need to provide a vestibule. A. Building entrances with revolving doors. B. Doors not intended to be used as a building entrance. Per CXGBS's follow-up memo, BBB will provide signage on exit doors indicating they are for exit only and on HC doors indicating they are for HC use only.
VEI	M4	M3.03 – 1	Unclear how volume damper for return air will be accessible to allow for balancing of system	Are all remote actuators located in remote damper actuator cabinet in mechanical room?	Refer to general note 2 on drawing M1.03. All volume dampers are remote actuated and controller is located in mechanical room on M3.01. Will coordinate access to dampers in ceiling.
VEI	M5	M1.01, A1.11	Insufficient information provided for ceiling type in basement area below existing offices. Unclear how balance dampers and fire dampers for new duct installation will be accessed.	Access doors not shown in either mechanical or architectural drawings. Unclear how balance dampers will be accessed.	Access through ceiling coordinated with architect after 100% review drawings were issued. This access will be shown on architectural RCPs. The existing ceiling is a suspended ceiling with ACT that will need to be partially removed to put in the ductwork and reinstalled to original appearance when install is in place. The ACT ceiling will allow for continued access to the ductwork and dampers post construction. Refer to detail 4 on drawing M5.01 for fire damper access.
VEI	M11	M1.01	Access to fire/smoke damper for ductwork into area below existing office midway between column lines P4 and P5 at column line PH not shown.	Notation for FSD no longer shown at this location. Please confirm FSD not needed.	No FSDs are required per coordination with PEG.
VEI	M13	M6.01, M7.01	ERU-1 control diagram shows 2 cooling coils. Schedule only gives data for one coil	Provide proper data for both coils in schedule	This is a split coil. Schedule indicates total capacity of coils. Will clarify on drawings for Bid Set Submission.
VEI	M14	M6.01, M7.02	AHU-1 control diagram shows 2 cooling coils. Schedule only gives data for one coil	Provide proper data for both coils in schedule	This is a split coil. Schedule indicates total capacity of coils. Will clarify on drawings for Bid Set Submission.
VEI	M18	Mechanical documentation	Design submittal does not show how system will meet required energy savings from OPR	Recommend showing how system will meet energy savings requirement by providing energy model calculations.	Refer to MEP Calculations Binder provided with 100% design review submission for energy model calculations.

VEI	M27	M1.01	CFM for return ducts in Rms. 006 and 007 not given.	Show CFM for both return ducts to allow for proper balance of system	Supply air = return air. Will show CFM on drawings for Bid Set Submission.
VEI	M28	M1.01	No thermostat tied to VAV-1.10	Show location of thermostat for VAV-1.10	Will show thermostat on drawings for Bid Set Submission.
VEI	M29	M1.01, M1.04	Unclear on VAV unit numbers for the two VAVs located in Rm 010 which served the first floor.	Rework VAV callout to make VAV number clearer.	VAV designated VAV1.x serve lower level while those designated VAV 2.x serve upper floor. Will add note to M0.01 and M6.01 for clarity for Bid Set Submission.
VEI	M30	M1.01	Furthest supply grille for VAV-1.5 does not show grille type and CFM.	Show grille type and cfm value	Will show diffuser tag on drawings for Bid Set Submission.
VEI	M31	M1.01	Second exhaust grille does not show grille type and CFM	Show grille type and cfm value	Will show diffuser tag on drawings for Bid Set Submission.
VEI	M32	M1.01	Linear diffusers seving café/seating area are shown to be balanced at 230 CFM. VAV-1.2 and VAV-1.3 are shown to have 3 linear diffusers each. If each diffuser is to be balanced at 230 CFM, this would have a maximum CFM for the box of 690cfm. Boxes are rated at maximum of 920 and minimum of 645.	Recommend reviewing CFM requirements for each VAV.	Linear diffusers will be added so each VAV box serves four diffusers for a total of 920 CFM for the Bid Set Submission.
VEI	M33	M1.01, M1.04	VAV noted as VAV-5.2. Schedule does not show this VAV. Also, notation for thermostat on M1.02 notes a VAV-2.12	Show correct name for VAV	VAV labeled 5.2 will be changed to VAV 2.12 for the Bid Set Submission.
VEI	M34	M1.02	A CO2 sensor is located at column at entrance to Upper Exhibit Area from Pavilion South Ramp with no notation to which VAV is to be controlled by sensor.	Add notation to CO2 sensor	Will add note to drawing M1.02 for Bid Set Submission.
VEI	M35	M1.03	RA balance CFM requirement not shown for RA grilles serving west side of north and south ramps	Add notation for RA balance CFM	Will add note for RA CFM for Bid Set Submission.
VEI	M36	M6.01	Unclear of location of VVDE-3	Clarify location of damper.	Will show VVDE on plans for Bid Set Submission.
VEI	M37	M6.01, M3.01	VVD-1 and VVD-2 on schedule are noted as VAVd-1 and VAVD-2 on M3.01.	Recommend having same nomenclature on each drawing page to eliminate any confusion.	Labels designations will be coordinated for Bid Set Submission.
VEI	M38	M5.05	ERU notation J does not note MERV rating level	Recommend adding MERV rating level	Refer to note 3 on ERU schedule for MERF rating of filters. Will add note to detail for Bid Set Submission.

VEI	M39	M6.01	CFM rating for DHC-1 is much larger than CFM shown in HVAC plans	Recommend reviewing CFM requirement for DHC-1.	CFM for DHC will be coordinated for Bid Set Submission.
VEI	M40	M6.01	GPM values not given for hot water duct heaters	Show GPM for each duct heater	Will show GPM for duct heaters on plans for Bid Set Submission.
VEI	M41	M1.01, M6.01	Max and Min airflows for VAV-1.8 not the same between schedule and drawings	Verify correct CFMs	Will coordinate airflows between plan and schedule for Bid Set Submission.
VEI	M42	M1.01, M6.01	VAV box serving Rms. 019, 011, 014 and 018 called out as VAV-2.1. Based upon mechanical schedule, this box should be VAV-1.6.	Verify correct VAV name	Box designation is VAV-1.6 and will coordinate plans and schedule for Bid Set Submission.
VEI	M43	M1.01, M6.01	VVE box serving Rms. 017, 016, 012 called out as VVE-1.2. Based upon mechanical schedule, this box should be VVE-1.1	Verify correct VVE name	Box designation is VVE-1.1 and will coordinate plans and schedule for Bid Set Submission.
VEI	M44	M1.01, M6.01	Callouts for both VVE boxes on HVAC layout show same max and min CFM. Mechanical schedule shows different max and min values.	Verify correct max and min CFMs.	Will coordinate airflows between plan and schedule for Bid Set Submission.
VEI	M45	M2.01, M6.01	Mechanical piping layout shows HWR/S piping to FCU. Mechanical schedule shows FCU to have electric heat.	Verify heating requirement for FCU. If unit is to be electric heating, remove HW piping from design.	Fan coil has hot water heat and schedule will be revised for Bid Set Submission.
VEI	M46	M7.02	ERU-1 control diagram shows 3 exhaust boxes. HVAC duct layouts only show two exhaust boxes, one serving toilets and one serving gift/food.	Verify correct number of exhaust boxes	Will show all exhaust VAVs on plans for Bid Set Submission. Refer to VAV and VVD schedules on M6.01 for all three terminal units.
VEI	M47	M7.02	Gift/Food exhaust box noted as variable volume and toilet exhaust box noted as constant volume.	Verify box type. See comment M44.	Toilet exhaust box is constant volume by code while others are variable to maintain pressure differentials between spaces.
VEI	M48	M7.02	Sequence of operation notes CO2 sensor in return duct. Control diagram does not show CO2 sensor in return ductwork.	Verify location of CO2 sensor used in ERU control sequence.	Will show CO2 sensor location on plans for Bid Set Submission.
VEI	M49	M7.02	CO2 setpoint	Recommend CO2 setpoint be 700 ppm above ambient.	Will revise CO2 setpoint in controls sequence for Bid Set Submission.
VEI	M50	M7.02	Temperature control sequence	Supply further detail on desired control of enthalpy wheel for all space, return, and OA dew point conditions	Will add detail for enthalpy wheel control to sequences for Bid Set Submission.
VEI	M51	M7.02	Smoke detection, high duct static pressure detection and outside air emergency shut-off reference a return damper.	Clarify location of return damper.	Will clarify sequence for Bid Set Submission.

VEI	M52	M7.02	High duct static pressure detection notes closing EA damper when HSPS is in alarm. There is no notation for the exhaust fan. Closing EA damper while EF is on may lead to pressure issues in exhaust duct.	Review control of EF during in this sequence.	Will clarify sequence for Bid Set Submission.
VEI	M53	M7.02	Outside air emergency shut-off and emergency power shut off reference relief air damper.	Recommend changing relief air damper to exhaust air damper	Will revise sequence for Bid Set Submission.
VEI	M54	M7.03	Unoccupied mode for cooling space notes modulating OAD.	Recommend keeping OAD closed and allowing only chilled water valve modulation to occur. Modulating open OAD during unoccupied mode can add additional cooling loads to system if outside air is of high humidity or is at a warmer temperature than the interior space temperature.	Will investigate revising sequence for Bid Set Submission.
VEI	M55	M7.03, M7.04	No control sequence for VVD-1, VVD-2, DHC-1, and DHC-2	Supply control sequence.	Will add sequences to drawings for Bid Set Submission.
VEI	M56	M7.03, M7.04	Conflict with CO2 concentration setpoint between AHU sequence and VAV box sequence.	Recommend setting CO2 setpoint at 700 ppm above ambient and modify alarm setpoint	Will coordinate sequences for Bid Set Submission.
VEI	M57	M7.03	Static pressure alarm sequence references return fans	Remove reference to return fans	Will delete references to return fan for Bid Set Submission.
VEI	M58	M7.03	Emergency power off sequence and outside air emergency shut-off has reference to relief air damper	Remove reference to relief air damper	Will delete references to relief air damper for Bid Set Submission.
VEI	M59	M7.04	FCU heating sequence	See comment M45 and revise sequence as necessary based upon correct heating source	Sequence is correct for hot water heating.
VEI	M60	M7.03	No sequence for humidifier in AHU	Provide control sequence for humidifier	Will add control sequence for humidifier for Bid Set Submission.
VEI	M61	238219	FCU specification calls for heating coils.	See comment M45	Specification is correct. FCU has hot water heating.
VEI	M62	HVAC controls	Unclear how humidity levels will be controlled in building	Clarify how humidity will be controlled.	Will add sequence for humidity control for Bid Set Submission.
VEI	M63	Mechanical specifications	No specification verbiage for variable air volume dampers or duct heating coils.	Provide specification verbiage.	Will add VVD and DHC requirements to specifications for Bid Set Submission.
VEI	M64	Energy Model	Energy Model Input and Results page notes daylighting controls for Upper Level, Section 1.4 chart notes no daylighting controls	Clarify which note is correct and verify whether daylighting was included in energy model if it is designed	Daylighting control is modeled by an on-off schedule per lighting control by astronomical time clock.

VEI	M65	Energy Model	Verify baseline fan power has been calculated as required by ASHRAE 90.1-2007 Section G3.1.2.9	Verify baseline fan power has been calculated as required by ASHRAE 90.1-2007 Section G3.1.2.9	Fan power has been calculated per 90.1 and revised calculation submitted to USGBC.
VEI	M66	Energy Model	Verify ERU and AHU are modeled properly to account for energy usage from each piece of equipment in proposed model.	Verify ERU and AHU are modeled properly to account for energy usage from each piece of equipment in proposed model.	ERU and AHU have been modeled properly. Specifically VEI revisited the fans, energy recovery wheel to make sure the correct input was used.
VEI	M67	Energy Model	Verify baseline exterior lighting in energy model is based upon calculated exterior LPD using values from ASHRAE 90.1-2007 Table 9.4.5.	Verify baseline exterior lighting in energy model is based upon calculated exterior LPD using values from ASHRAE 90.1-2007 Table 9.4.5.	Baseline site lighting is modeled per ASHRAE Std. 90.1, and is even somewhat conservative is energy savings calculated.
VEI	P1	P6.01	Recommend using 1.28 gpf water closets and 0.5 gpf urinals to assist in meeting water reduction requirements	Recommend using 1.28 gpf water closets and 0.5 gpf urinals to assist in meeting water reduction requirements	Project is using 0.125 GPF urinals and 1.28 GPF WCs and plumbing schedule will be revised to document this for Bid Set Submission.
VEI	P3	P5.02	Detail title and pump label references SP-1 for elevator sump pump.	Change detail titles and pump label to SP-2	Will revise label for Bid Set Submission.
VEI	P4	223300 – 1.9	Water heater warranty given as 3 years, OPR requires 5 year warranty	Revise to provide 5 year warranty	Will revise to provide 5 year warranty for Bid Set Submission.
VEI	E4	General Electrical Design	Consider UPS size, load capability, and location if UPS is required for Security or IT equipment	Brian Whitlock (with Protective Engineering Group) will provide information.	Outdoor security cameras require UPS power. Circuits are being provided back to an existing panel served by a central UPS. No other equipment required to be on UPS power.
GSX	E5	Lighting and Daylighting	Recommend lowering lighting power density values to 30% below ASHRAE 90-1-2007 values	Lighting designer response is needed	GSX has attempted to reduce the LPD as much as possible in consort with the electrical engineer's BOH design.

BBB/C&G/VEI	E9	Daylighting strategy	Indirect, diffuse reflected daylight, or daylight from north facing vertical glass is preferable for video display visibility. While a case can be made that displays would remain visible at 2000 fc when using high brightness glare resistant screens, one cannot conclude that it would be either thermally or visually comfortable to stand and view such a display in direct sunlight when adjacent displays are shaded from direct solar gain. The transient nature of daylighting, as daylight moves from one part of the display to another, is sure to cause complaints from users. The comfort and usability of the displays should take precedence over the architectural use of skylights.		The direct insolation has been considered in many ways: the finish of the curved walls are matte, not glossy, and the cases always have tops to reduce both light falling on artifacts and to avoid direct sunlight creating harsh lighting conditions. In the case of video elements, the theater was deliberately shaped to avoid sunlight and has a trellised cover to further reduce the amount of daylight in the space. For other video elements that are out in the brighter spaces have been specified to have relatively high lumen output, with a minimum NIT (brightness) greater than the maximum light projected to fall on that spot. Also, in designing the video and interactive treatments, great care has been taken to use white backgrounds as this counteracts the glare and reflections inherent in a bright space. Thermal comfort was addressed in the response to A31. Additional information related to this topic will be provided in the response to the CXGBS Technical Memo dated 04.12.12.
VEI	E10	E3.01	Recommend separating loads by type (lighting, equipment, process) and metering each load type. This will help GSA better monitor the performance of the building and provide opportunity to attempt LEED EAc5 Measurement and Verification.		LEED M&V is not being pursued due to the cost implications. A stand alone digital meter will be added to the project to give GSA the opportunity to monitor the overall power consumption of the pavilion.
C&G	E11	Exhibits	Recommend audio/visual termination and wiring be listed as a separate line item in the general contractors schedule of values (this should be separated out to not include the conduit, i.e. conduit as separate line item also)		AV wiring to AV devices is not part of the Base Building contract and will be included in a separate package for all AV and Exhibits fabrication and installation. BBB will add note to clarify this in Spec Section 011100 - Summary regarding projects to be coordinated with the Base Building.
C&G	E12	Exhibits	Recommend controls be listed as a separate line item in the general contractors schedule of values		AV wiring to AV devices is not part of the Base Building contract and will be included in a separate package for all AV and Exhibits fabrication and installation. BBB will add note to clarify this in Spec Section 011100 - Summary regarding projects to be coordinated with the Base Building.

VEI, GSX	E13	Lighting design	I did not see a report on connected lighting power density for the space.	Please forward for review. Connected ambient load for museum display should, without controls, be less than 1.0 w/sf.	LPD loads submitted with energy model.
VEI, GSX	E14	Lighting design	Metal halide sources are appropriate for high ceiling height lighting in the lobby area if they are not used in the daylight hours. This light source, however, cannot be readily controlled with daylight sensors.	How are they being controlled?	MH sources being controlled by astronomical time clock within smart circuit breaker panel.
GSX	E15	Lighting design	GE PAR-38 LED screw-based lamps have been specified, presumably for use in incandescent track heads. LiteLab, the mfr of the track fixtures, offers internal ambient and case temperature measurement of LED lamps submitted to them. It is essential that LED lamps not be subjected to high case temperatures, or color shifting and shorter lamp life will ensue.	LiteLab, the mfr of the track fixtures, offers internal ambient and case temperature measurement of LED lamps submitted to them. It is essential that LED lamps not be subjected to high case temperatures, or color shifting and shorter lamp life will ensue.	GSX agrees that any and all lamps subjected to high case temperatures will typically reduce life of the source. The product specified for use in the luminaries for this project are not marketed for use in a non-enclosed luminaire such as a trackheads and are therefore considered a viable product for the intended purpose of generating controlled efficient output with a higher efficacy.
GSX	E16	Lighting design	Metal halide sources are used for the majority of exterior lighting. With many excellent LED exterior light sources now available.	Were LED luminaires not considered? If so, what is the reason they were not used?	GSX considered the use of LED sources for these and many other sources in this project. Due to limited optical performance, as well as prohibitive cost, LED's were ruled out for the exterior lighting of the pavilion and historic façade.
VEI, GSX	E17	Lighting design	How does exterior connected lighting load compare with ASHRAE 90.1-2007?		LPD loads submitted with energy model.
GSX	E18	Lighting design	Specified lighting is mainly track mounted metal halide and incandescent lamp holders by Lite Lab. Consider more efficient alternatives.	Consider more efficient alternatives.	GSX considered the use of LED sources for these and many other sources in this project. Due to limited optical performance, as well as prohibitive cost, LED's were ruled out for flexible exhibit/accent illumination.
VEI	E19	E3.01, E7.01, E7.02	Lighting panels L4CP-EXT & L4CP-INT shown on one-line to be fed from M4NLL are not listed on M4NLL Panel Schedule	Check design and add 3 pole panel feeds and to Panel Schedule	Will indicate on panel schedule for Bid Set Submission.
VEI	E20	E3.01, E7.01	Lighting control panel N-DIM shown on one-line to be fed from M4NLL Section 1 is not listed on M4NLL Panel Schedule	Check design and add to Panel Schedule	Will indicate on panel schedule for Bid Set Submission.
VEI	E21	E7.01	Circuit P2NLL-72 does not list which Lighting Control Plane is to be fed	Check design and add panel name to circuit load description	Will indicate on panel schedule for Bid Set Submission.

VEI	E22	E3.01, E7.01	Circuits feeding through Lighting Relay Panels do not indicate which of the 6 lighting relay panels	Indicate which lighting relay panels in Panel Schedule Branch Circuit Load Descriptions	Will indicate on panel schedule for Bid Set Submission.
VEI	E23	E2.01, E7.01	Circuit numbers P2NLL-50, -46, & -51 in Power Plans do not agree with P2NLL Panel Schedule	Check design and correct wiring discrepancies	Will verify and correct for Bid Set Submission.
PEG	E24	FA1.00, FA1.03	FA1.00 Fire Alarm General Note #3 and FA1.03 Key Note #3 indicate location of new node in Pavilion basement room B103 which is actually Electrical Room 005.	Correct Notes reference to indicate proper room of new fiber optic cable node	Room name will be updated for Bid Set Submission.
PEG	E25	FA1.03	Reference for continuation for fiber cable refers to drawing FA1.02 but is on FA1.01	Correct Note and drawing for proper continuation reference	Drawing continuation reference will be corrected for Bid Set Submission.
PEG	E26	FA5.02, FA1.01	Fire Alarm Annunciator drawing location of new Remote Fire Alarm Control Panel (Lower Level) in corridor is misleading	Suggest location in Electrical Control Room 005 be better indicated on drawing.	Location of the remote fire alarm control panel will be better represented on the drawing for Bid Set Submission.

Serving the Life of Your Building
Commissioning & Green Building Solutions, Inc.

Technical Memorandum

PROJECT: **United States Diplomacy Center – Phase I**

PREPARED FOR: Project Team

PREPARED BY: David Cantrill

COPIES:

DATE: July 21, 2014

RE: Submittal Reviews

RESPOND BY: August 4, 2013

CxGBS® reviewed the submittals as indicated below for the specific criteria relating to the process of Commissioning. As the Commissioning Authority, Commissioning & Green Building Solutions, Inc. is not responsible for design concept, design criteria, compliance with codes, design or general construction scheduling, cost estimating, quality control, or construction management.

Designer to reply to exceptions in appropriate column below.

Submittal	Received	Status	CxGBS Comments	Designer Response	CxGBS Reply	Date
233413-001-0 Axial HVAC Fans	July 8, 2014	No exceptions				
221316-001-0 Sanitary Waste & Vent Piping	July 8, 2014	No exceptions				
221429-001-0 Sump Pumps SP-2 and SP-3	July 8, 2014	No exceptions				
221116-001-0 Domestic Water Piping	July 9, 2014	No exceptions				
221119-001-0 Domestic Water Piping Specialties	July 9, 2014	No exceptions				
232113-001-0 Hydronic Piping	July 9, 2014	No exceptions				
220523-001-0 General Duty Valves	July 9, 2014	No exceptions				
221319-001-0 Sanitary Waste Piping Specialties	July 9, 2014	No exceptions				
221423-001-0 Storm Drainage Piping Specialties	July 9, 2014	No exceptions				

Serving the Life of Your Building
Commissioning & Green Building Solutions, Inc.

Technical Memorandum

PROJECT: **United States Diplomacy Center**
PREPARED FOR: GSA, Heery International
PREPARED BY: David Cantrill
COPIES:
DATE: September 23, 2014

CxGBS© has reviewed following submittals and request the comments be included in the ePM system for each submittal.

Submittal	CxGBS Comment
232923-001-0 Variable Frequency Devices (RF-1 and RF-2)	No exceptions
233300-001-0 Air Duct Accessories Product Data & Shop Drawings	No exceptions
260539-001-0 Underfloor Raceways for Electrical Systems – Product Data	Not in Scope of Work
260526-001-0 Grounding and Bonding for Electrical Systems – Product Data	Not in Scope of Work
233713-001-0 Air Outlets and Inlets Product Data	No exceptions
261113-001-0 Interior Lighting Fixtures Product Data	Exceptions 1. Lamp for DVC-14D submitted as 50W, design calls for 75W, verify if 50W per fixture provides adequate lighting levels 2. Fixture DVC-21 submitted as an in ground fixture, design calls for surface mounted fixture 3. Lamp for DVC-24C submitted as 26W, design calls for 18W 4. Lamp for DVC-24D submitted as 26W, design calls for 18W 5. No lamp submitted for DVC-29 6. No lamp submitted for DVC-40

Serving the Life of Your Building
Commissioning & Green Building Solutions, Inc.

160608 COMMISSIONING TESTING REPORT

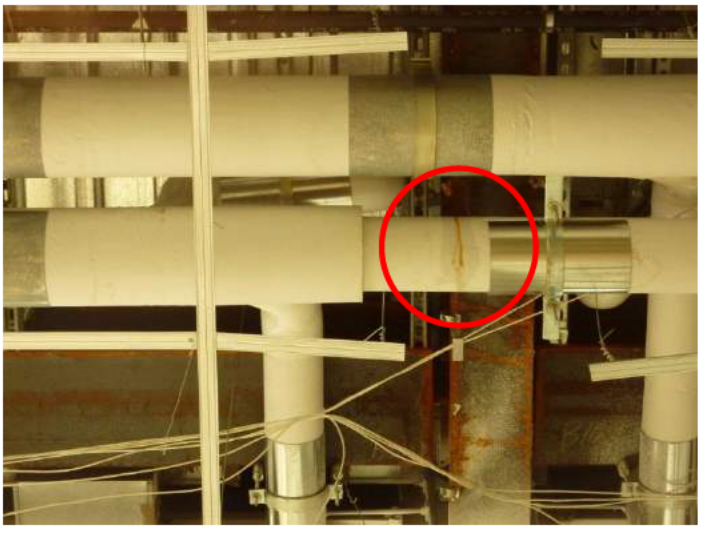
PROJECT:	**U.S. Diplomacy Center**
PREPARED FOR:	GSA
PREPARED BY:	H. Jay Enck
COPIES:	DOS, Gilbane, BBB
REPORT DATE:	8 June 2016

CxGBS conducted job site observations and testing of the roof on June 1 and June 2, 2016. Weather conditions during site visits: Outside Temperature: mid 60s°F to low 80s°F, Sky Condition: Partly Cloudy, Site Condition: Dry.

Water Intrusion from North Lower Roof:

Adjacent to the northern upper roof assembly testing conducted during the site visit resulted in water intrusion through the northern lower roof assembly into the building interior. The water was observed traveling along the metal deck channels below the lower roof membrane and daylighting at the metal deck opening of the lower roof storm water drain body as shown in the photographs below. During the testing of the upper roof minor small areas of water from light overspray collected on the lower roof area in shallow ponds less than ten square feet of area adjacent to the interior location were the leak became visible.

The area was allowed to dry and testing of the high roof northern area was conducted to determine if there was a connection using care not to wet the lower roof. No leak developed after several hours of testing of the upper roof. As the lower roof installation is not complete no testing of the lower roof system was conducted to determine how water was penetrating the lower roof assembly. The roof design does not allow flood testing due to the internal gutter channels with the metal roof assembly. Test method for lower roof will utilize sheet flow across the lower metal roof assembly when roof is complete.



Issue #36

Evidence of a leak shown caused by roof leak from lower roof on north side of the facility, approximately 8 feet from west wall.

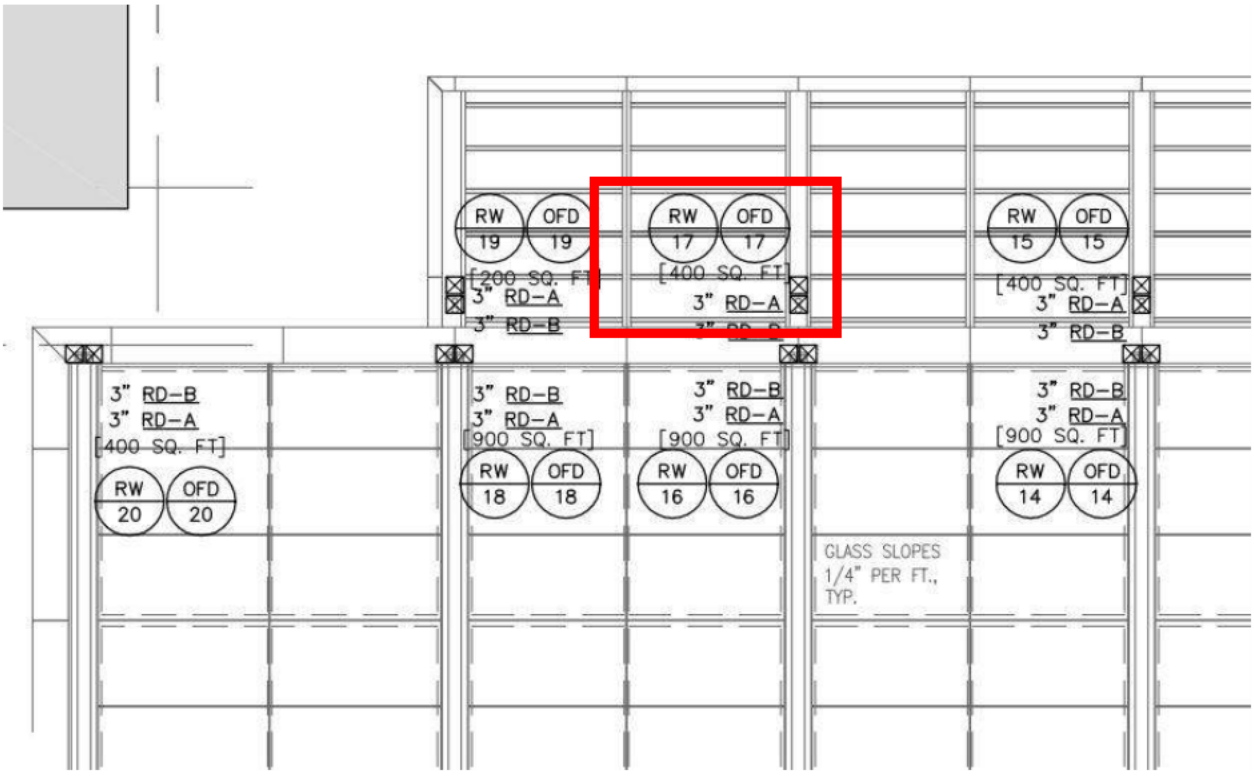
The area in the Red box shown in the plan view on following page is the general area of the leak.

Issue #36 ctd

Roof drain as it penetrates the lower metal deck. Water was observed traveling along the metal deck ribs.

Because the lower roof is not complete, the source of the leak could not be determined at time of site visit.

Contractor to determine source of leak and repair in order to eliminate all moisture intrusion.

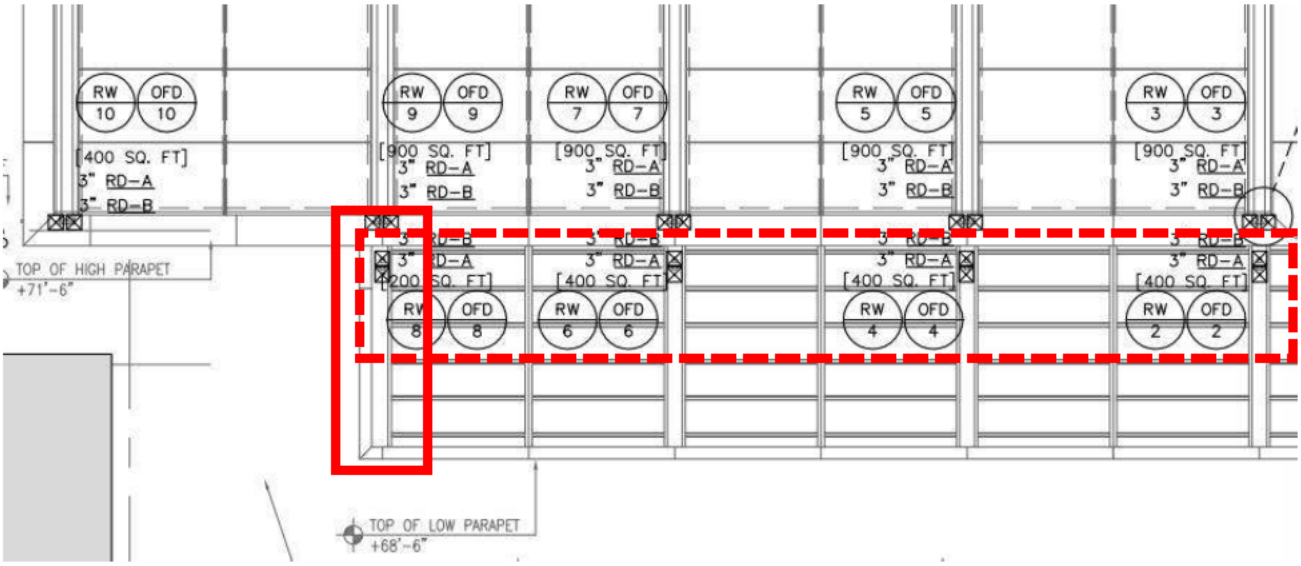


Testing of Southern Lower Roof Stormwater Drains:

Evaluation of the lower roof storm water drainage system was conducted for portions of the south lower roof area of the facility through flood testing. During this test, the main roof drain and overflow drain of the south lower roof were plugged and the gutter flooded to a height of just above the overflow drain inlet for a period of just over one hour.

Issue #37

The western most lower roof drain on the south roof, outlined in Red below, failed allowing water to enter the building interior.



Issue #38

The same lower roof drains (outlined with the Red dashed line shown above) were also packed with ice and condensation potential evaluated using an infrared thermometer. Condensation concerns were confirmed with measuring surface temperature of the roof deck adjacent the lower roof drain bodies and pipe support assembly. During test, surface temperatures recorded were near dew point temperature.

Issue #38 ctd

Photographs show gaps that must be closed and areas in which additional insulation must be applied to seal against metal deck and adjacent enclose pipe hanger.

The clevis hanger body protruding beyond the insulation must be completely insulated.

Building Enclosure Observations:

Issue #39

Image shows construction debris being flushed into storm water system due to no strainers in place.

Suggest temporary ¼" hardware cloth cover over the drain opening in order to prevent large pieces of construction debris entering system.

Issue #40

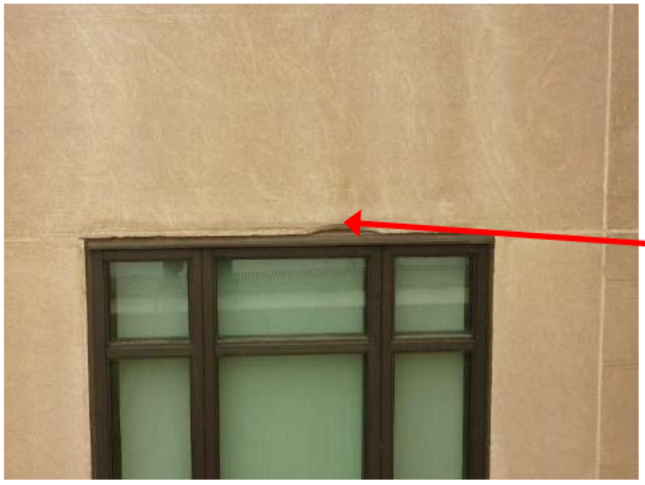
Image shows damaged copper flashing on the Harry S. Truman building.

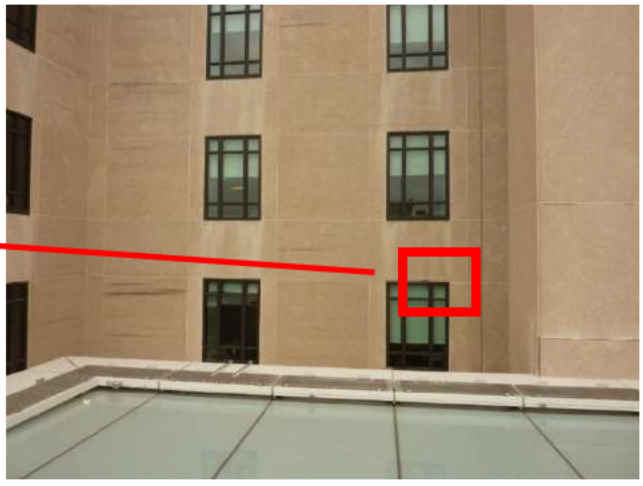
Repair copper flashing.

Existing Conditions

Images show spalled areas south elevation of the Harry S. Truman building adjacent USDC addition.

While contractors are currently on site, we recommend that these areas be repaired.



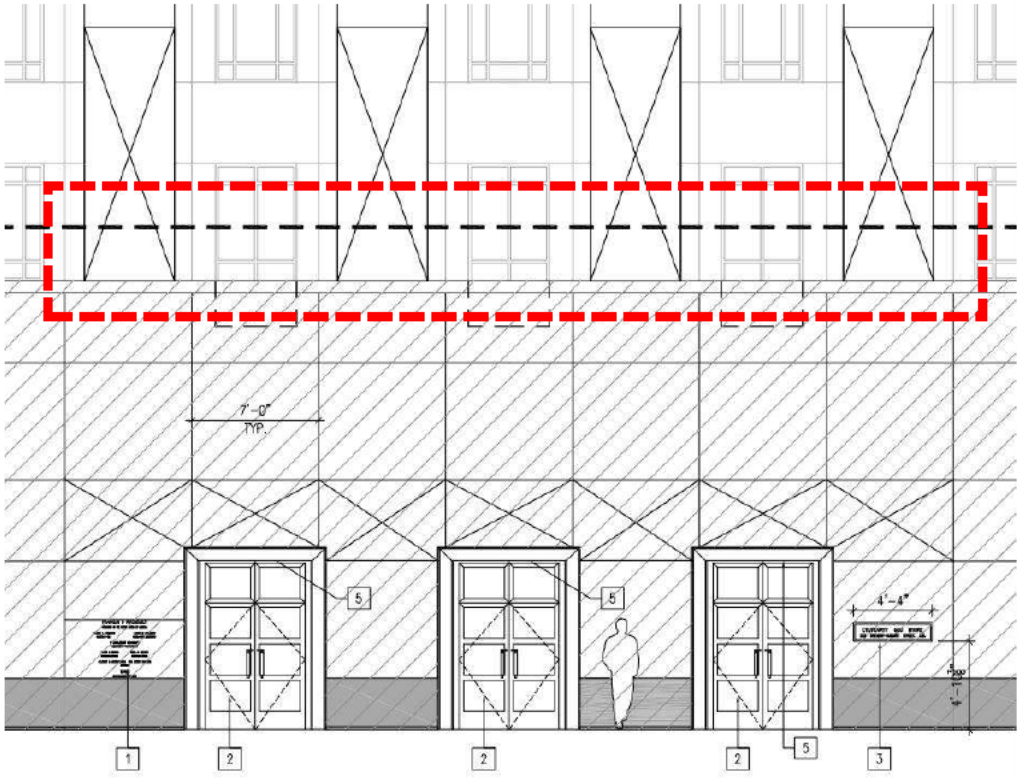


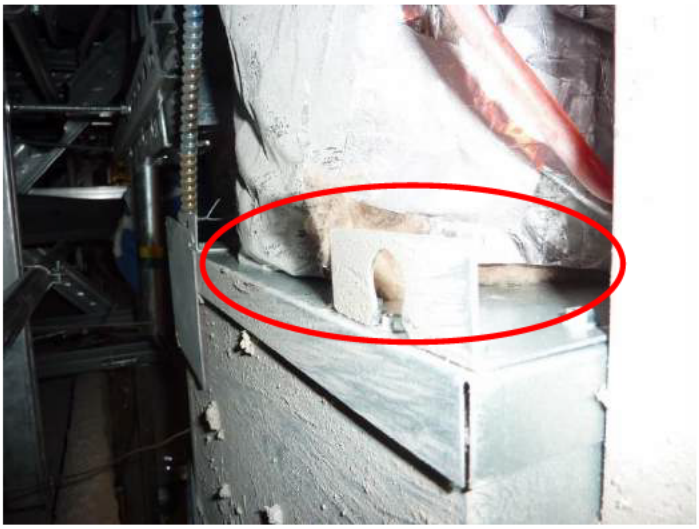
Issue #41

Typical at all four columns outlined in red dashed line in the elevation drawing shown below.

Cracks in the mortar joint shown at columns above the intersection with the USDC addition. These cracks are due to movement of the lower lime stone panel probably due to removal of lover stone section to accommodate tie in to new construction.

Remove and replace cracked mortar joints.

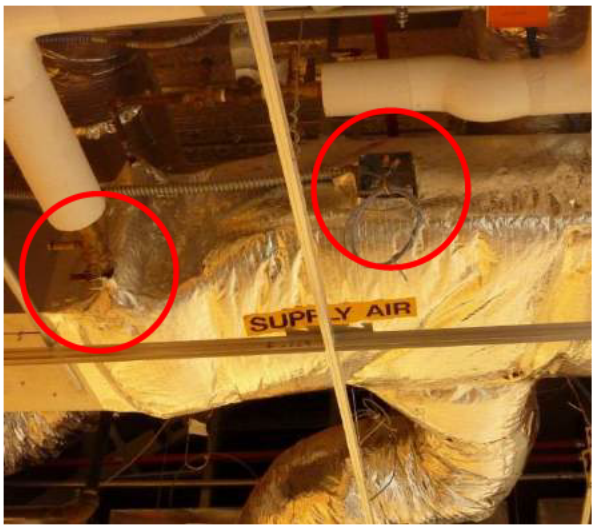




Issue #42

Vapor barrier discontinuities have been identified in a number of areas.

Seal vapor barrier at all penetrations, intersections, and terminations at assemblies.



Issue #42 ctd

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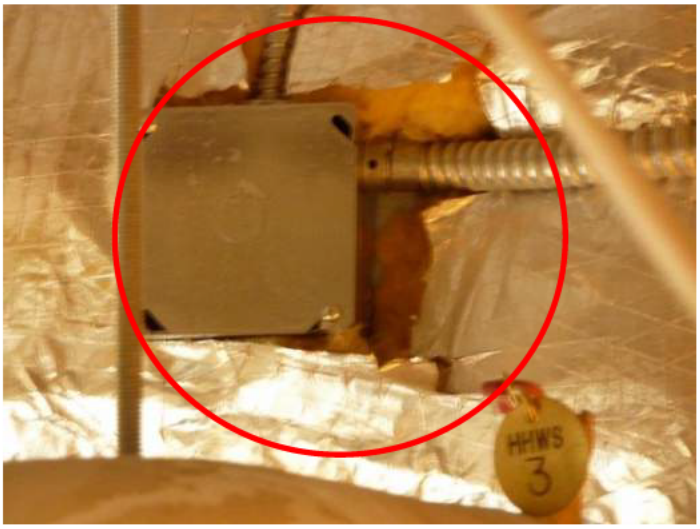
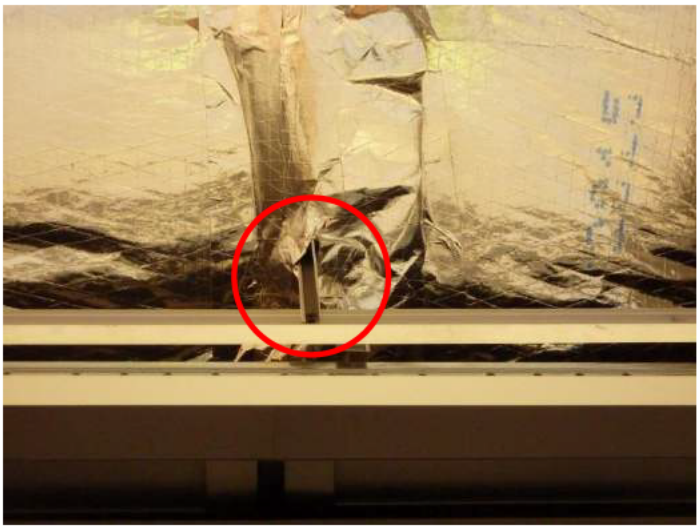
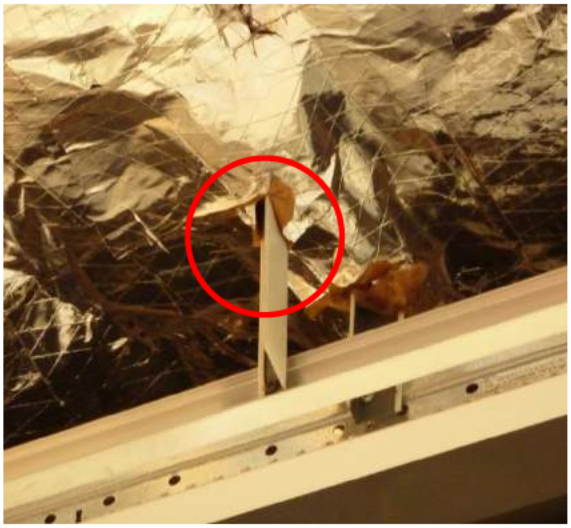




Issue #42 ctd

Vapor barrier discontinuities have been identified in a number of areas.

Seal vapor barrier at all penetrations, intersections, and terminations at assemblies.



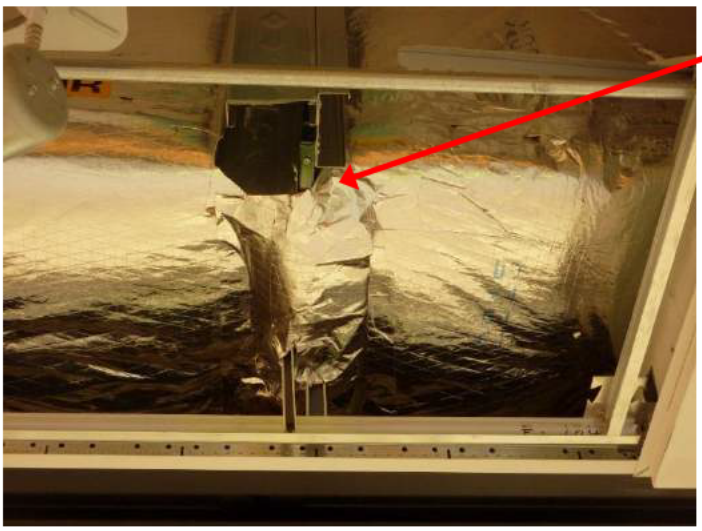
Issue #43

A thermal bridge has been created by the duct support shown at left. The support is in contact with the duct within the insulation, exits the insulated assembly, and then is in contact with the steel structure above.

Relocate duct support to eliminate thermal bridge. Seal penetration where support exits vapor barrier.

Issue #44

A number of duct sections have not been installed fully extended and have an un-necessarily tight bend radius. This condition causes a need for increased fan power in order to supply airflow, increasing energy consumption by the HVAC system. Install flex duct in accordance with ADC Flexible Duct Performance & Installation Standards and ASHRAE Handbook of Fundamentals 2013 to minimize pressure drop and flow restrictions.



Duct section is compressed by adjacent assembly. Reducing insulation effectiveness.

Reinstall duct in a position to eliminate compression and reduced insulation thickness.

Functional Test Procedure - Exhaust Fan

Pre-test Checks (Include information listed in parenthesis in numbered boxes below)

1 - Startup reports and construction checklists submitted and approved, equipment ready for testing? (Yes/No)
2 - Controls contractor has documented that all control system functions for this and associated interlocks are programmed and operable per contract documents, including final setpoints and schedules with debugging, loop tuning and sensor calibrations completed. (Yes/No)
3 - All A/E punch list items for this equipment have been corrected? (Yes/No)
4 - Safeties and operating ranges reviewed? (Yes/No)
5 - Current setpoints, control parameters, limits, delays, lockouts, schedules recorded? (Yes/No)
6 - Unit mounted Securely, accessible for servicing and does not produce any unusual noise or vibrations? (Yes/No)

Participants

Company	Name and Role	
CxGBS	Jay Enck (Commissioning)	
Siemens	Chris Wooten	

Date and Time of Testing

Unit ID#	1	2	3	4	5	6							
EF-1	Y	Y	N/A	Y	Y	Y							
EF-2	Y	Y	N/A	Y	Y	Y							
EF-3	Y	Y	N/A	Y	Y	Y							
EF-4	Y	Y	N/A	Y	Y	Y							

	Testing Sequence	Expected Response	Unit ID# EF-1	EF-2	EF-3	EF-4
1	**Enable:** Enable exhaust fan thru thermostat or BAS	Exhaust fan runs without problematic noise or vibration	Y	Y	Y	Y
		Damper Opens	Y	Y	Y	Y
2	**Disable:** Disable exhaust fan thru thermostat or BAS	Fan stops running	Y	Y	Y	Y
		Damper Closes	Y	Y	Y	Y
3	**Pre Test**	Return to Pre Test Setpoints	Y	Y	Y	Y

Functional Test Procedure - Air Handling Units

Pre-test Checks (Include information listed in parenthesis in numbered boxes below)

1 - Startup reports and construction checklists submitted and approved, equipment ready for testing? (Yes/No)
2 - Controls contractor has documented that all control system functions for this and associated interlocks are programmed and operable per contract documents, including final setpoints and schedules with debugging, loop tuning and sensor calibrations completed. (Yes/No)
3 - All A/E punch list items for this equipment have been corrected? (Yes/No)
4 - Test procedures reviewed and approved by installing contractor? (Yes/No)
5 - Safeties and operating ranges reviewed? (Yes/No)
6 - Current setpoints, control parameters, limits, delays, lockouts, schedules recorded? (Yes/No)
7 - Schedules and setpoints modified? (Yes/No)
8 - False loading equipment, system and procedures ready (boilers, preheat or reheat coils, control loops, over-ride on OSA dampers, etc.) (Yes/No/NA)
9 - BAS parameters, setpoints and logic sequences appear to follow the manufacturer written sequences? (Yes/No)
10 - Packaged control program parameters, setpoints and logic sequences appear to follow the manufacturer written sequences? (Yes/No)

Participants

Company	Name and Role	
CxGBS	Jay Enck (Commissioning)	
Siemens	Chris Wooten	

Date and Time of Testing

Unit ID#	1	2	3	4	5	6	7	8	9	10			
AHU-1	Y	Y	N/A	Y	Y	Y	N	Y	Y	Y			

Unit ID#

	Testing Sequence	Expected Response	AHU-1
1	**Occupied Mode:** Set unit in unoccupied mode.	Supply Smoke Isolation Damper Opens	Y
		RAD opens	Y
		OAD opens to minimum	Y
		Supply air fan energizes	Y
		Return air fan energizes	
		VFD modulates to maintain duct static pressure	Y
2	**Unoccupied Mode:**	Supply air fan de-energizes	Y
		Return air fan de-energizes	Y
		OAD closed	Y
		RAD open	Y
		Chilled water valve closed	Y
	Manipulate room temperature value to be below setpoint	Supply air fan energizes	Y
		Return air fan energizes	Y
		Heating valve modulates to maintain discharge air temperature	Y
	Manipulate room temperature value to be above setpoint	Supply air fan energizes	Y
		Return air fan energizes	Y
		Cooling valve modulates to maintain discharge air temperature	Y

Functional Test Procedure - Air Handling Units

3	**Morning Warmup**	Supply air fan energizes	Y
		VFD modulates to maintain duct static pressure	Y
		All VAVs in occupied mode	Y
		Heating valve closed	Y
		OAD closed	Y
		RAD closed	Y
		Heating valve modulates to maintain discharge air temperature	Y
	Return air temperature reaches 68F	OAD opens gradually until DAT drops to occupied mode temperature setpoint	Y
4	**Cool Down:**	Supply air fan energizes	Y
		VFD modulates to maintain duct static pressure	
		All VAVs in occupied mode	
		Heating valve closed	Y
		OAD closed	
		RAD open	
		Cooling valve modulates to maintain cooling discharge temperature setpoint.	
	Return air temperatuere exceeds 55°F		Y
		OAD opens gradually	
			Y
2	**Air Flow Control:** Modulate supply and return air static pressure setpoint to below current static pressure value Modulate supply and return air static pressure setpoint to above current static pressure value	Supply and return fan VFD modulates to maintain setpoint	Y
		Supply fan VFD increases	Y
		Supply fan VFC decreases	Y

Functional Test Procedure - Air Handling Units

	Discharge Air Temp Reset:		Y
	Set discharge airflow between 50-90% AHU capacity	Discharge air temperature setpoint modulates based on algorithm	
	Set discharge airflow belwo 50% AHU capacity	Discharge air temperature setpoint at max value	Y
2			
	Set discharge airflow above 90% AHU capacity	Discharge air temperatuer setpoint set at mimimum value.	Y
		Discharges cool air	
	Humidifier:		
	Set indoor humidity setpoint above current humidity levels	Humidifier energizes to maintain setpoint	Y
		Humidifier deenergizes to maintain setpoint	Y
	Set indoor humidity setpoint below current humidity levels		
2	Humidifier in operation	Humidifier drains and fills as necessary to supply humiidty requirements	Y
	Observer OA temperatuer at vavrying low temperatures.		
		Humifier indoor humidiity setpoint modulates to avoid condensation in building	Y
		Observe alarm when condensation conditions are likely	Y
	24/7 Mode:		
		Unit in occupied mode at all times	Y
2	Command unit to operate in 24/7 mode		
	Outside Air Emergency Shut Off:		
	Activate facility wide emergency outside air shut-off	Unit shuts down	Y
		OA damper closed	Y
		RA damper closed	Y
2			
	Emergency Power Off:		

Functional Test Procedure - Air Handling Units

2	Activate facility wide emergency power shut off	ERU shuts down	Y
		OA damper closed	Y
		RA damper closed	Y
2	**Emergency Constant Speed:**		
	Put supply fan in bypass mode	Supply fan runs at constant speed	Y
		All VAV boxes open to max damper position	Y
	Put return fan in bypass mode	Return fan runs at constant speed	Y
		All VAV boxes open to max damper position	Y
2	**Automatic Shutdown/Reset:**		
	Simulate power failure at unit	Unit shuts down	Y
	Restore power to unit	Unit restarts following sequence program to prevent overloading of electrical distruibution system	Y
13	**Alarms:**		
	Obsereve the following alarms	Freezestat	Y
		High Static Pressure	Y
		Low Static Pressure	Y
		RA Smoke Detector	Y
		SA Smoke Dectector	Y
		Supply fan failure	Y
		Return fan failure	Y

Functional Test Procedure - Air Handling Units

		High SA temperature	Y
		Low SA temperatuer	Y
		High RA humidity	Y
		VFD fault	Y
		Incorrect fan status	Y
		Humidity cylinder status	Y
		High filter differential pressure	Y
14	**Safeties:** Observe the following safeties		
		High SP limit	Y
		Temperatuer low limit	Y
14	**Duct Smoke Failure:** Fail duct smoke detector		
		Supply fan disables	Y
		Return fan disables	Y
		OA damper closed	Y
		RA damper remains 100% open	Y
16	**Pre Test**	Return to Pre Test Setpoints	Y

Functional Test Procedure - Computer Room Air Conditioning Unit

Pre-test Checks (Include information listed in parenthesis in numbered boxes below)

1 - Startup reports and construction checklists submitted and approved, equipment ready for testing? (Yes/No)
2 - Controls contractor has documented that all control system functions for this and associated interlocks are programmed and operable per contract documents, including final setpoints and schedules with debugging, loop tuning and sensor calibrations completed. (Yes/No)
3 - All A/E punch list items for this equipment have been corrected? (Yes/No)
4 - Test procedures reviewed and approved by installing contractor? (Yes/No)
5 - Safeties and operating ranges reviewed? (Yes/No)
6 - Current setpoints, control parameters, limits, delays, lockouts, schedules recorded? (Yes/No)
7 - Schedules and setpoints modified? (Yes/No)
8 - Packaged control program parameters, setpoints and logic sequences appear to follow the manufacturer written sequences? (Yes/No)

Participants

Company	Name and Role
CxGBS	Jay Enck (Commissioning)
Siemens	Chris Wooten

Date and Time of Testing

Unit ID#	1	2	3	4	5	6	7	8					
CRAC-1	Y	Y	N/A	Y	Y	Y	N	Y					
CRAC-2	Y	Y	N/A	Y	Y	Y	N	Y					

	Testing Sequence	Expected Response	CRAC-1	CRAC-2
	Status:			
1	Send status command of ON from BAS	CRAC unit functions on internal programming	Y	Y
		VAV Box Damper Opens	Y	Y
	Send status command of ON from BAS	CRAC unit off		
		VAV Box Damper closes	Y	Y
	Lead/Lag Operation:			
2	Send command to switch to lag CRAC unit	Lead CRAC unit off	Y	Y
		Lag CRAC unit on and functions on internal programming	Y	Y
	Fire Protection System:		Y	Y
3	Simulate Smoke Event	CRAC Unit Off		
		VAV Box Damper Closed	Y	Y
	Failure Mode:			
4	Fail lead CRAC Unit	Alarm sent to BAS	Y	Y
		LAG CRAC turns starts	Y	Y
			ri	

Functional Test Procedure - Computer Room Air Conditioning Unit

2	**Alarms:** Observe the following alarms			
		Leak Detection (BAS alarm)	Y	Y
		Leak Detection (local alarm)	Y	Y
16	**Pre Test**	Return to Pre Test Setpoints	Y	Y

Functional Test Procedure - Domestic Water Heater

Pre-test Checks (Include information listed in parenthesis in numbered boxes below)

1 - Startup reports and construction checklists submitted and approved, equipment ready for testing? (Yes/No)
2 - Controls contractor has documented that all control system functions for this and associated interlocks are programmed and operable per contract documents, including final setpoints and schedules with debugging, loop tuning and sensor calibrations completed. (Yes/No)
3 - All A/E punch list items for this equipment have been corrected? (Yes/No)
4 - Test procedures reviewed and approved by installing contractor? (Yes/No)
5 - Safeties and operating ranges reviewed? (Yes/No)
6 - Current setpoints, control parameters, limits, delays, lockouts, schedules recorded? (Yes/No)
7 - Schedules and setpoints modified? (Yes/No)
8 - BAS parameters, setpoints and logic sequences appear to follow the manufacturer written sequences? (Yes/No)
9 - Packaged control program parameters, setpoints and logic sequences appear to follow the manufacturer written sequences? (Yes/No)

Participants

Company	Name and Role	
CxGBS	Jay Enck (Commissioning)	
Siemens	Chris Wooten	

Date and Time of Testing

Unit ID#	1	2	3	4	5	6	7	8	9				
EWH-1	Y	Y	N/A	Y	Y	Y	N	Y	Y				

	Testing Sequence	Expected Response	Unit ID# EWH-1
	Operations:		
1	Water Heater Status ON	Water heater follows internal controls to output water at proper temperature	Y
		Hot water return circulation pump on	Y
	Mixing Valve:		
2	Observe water temperature at mutiple sinks and lavatories	Mixing valve sets to provide proper water temperatures to fixtures	Y
3	**Pre Test**	Return to Pre Test Setpoints	Y

Functional Test Procedure - Electric Heater

Pre-test Checks (Include information listed in parenthesis in numbered boxes below)

1 - Startup reports and construction checklists submitted and approved, equipment ready for testing? (Yes/No)
2 - All A/E punch list items for this equipment have been corrected? (Yes/No)
3 - Safeties and operating ranges reviewed? (Yes/No)
4 - Current setpoints, control parameters, limits, delays, lockouts, schedules recorded? (Yes/No)
5 - Unit mounted Securely, accessible for servicing and does not produce any unusual noise or vibrations? (Yes/No)

Participants

Company	Name and Role	
CxGBS	Jay Enck (Commissioning)	
Siemens	Chris Wooten	

Date and Time of Testing

Unit ID#	1	2	3	4	5								
EH-1	Y	Y	N/A	Y	Y								

	Testing Sequence	Expected Response	Unit ID# EH-1
1	**Occupied Mode** Enable unit thru manipulation of setpoint	Unit heater runs without problematic noise or vibration	Y
		Heating coil in energized	Y
		Warm air is delivered	Y
		Unit heater stops when occupied setpoin is met	Y
2	**Alarms** Observe the following alarms		
		Low Temperature Alarm	Y
		Unit Failure	Y
3	**Pre Test**	Return to Pre Test Setpoints	Y

Functional Test Procedure - Energy Recovery Unit

Pre-test Checks (Include information listed in parenthesis in numbered boxes below)

1 - Startup reports and construction checklists submitted and approved, equipment ready for testing? (Yes/No)
2 - Controls contractor has documented that all control system functions for this and associated interlocks are programmed and operable per contract documents, including final setpoints and schedules with debugging, loop tuning and sensor calibrations completed. (Yes/No)
3 - All A/E punch list items for this equipment have been corrected? (Yes/No)
4 - Test procedures reviewed and approved by installing contractor? (Yes/No)
5 - Safeties and operating ranges reviewed? (Yes/No)
6 - Current setpoints, control parameters, limits, delays, lockouts, schedules recorded? (Yes/No)
7 - Schedules and setpoints modified? (Yes/No)
8 - False loading equipment, system and procedures ready (boilers, preheat or reheat coils, control loops, over-ride on OSA dampers, etc.) (Yes/No/NA)
9 - BAS parameters, setpoints and logic sequences appear to follow the manufacturer written sequences? (Yes/No)
10 - Packaged control program parameters, setpoints and logic sequences appear to follow the manufacturer written sequences? (Yes/No)

Participants

Company	Name and Role	
CxGBS	Jay Enck (Commissioning)	
Siemens	Chris Wooten	

Date and Time of Testing

Unit ID#	1	2	3	4	5	6	7	8	9	10			
ERU-1	Y	Y	N/A	Y	Y	Y	N	Y	Y	Y			

Unit ID#

	Testing Sequence	Expected Response	ERU-1
	Occupied Mode:	Outside air damper opens	Y
1	Set unit in unoccupied mode.	Supply smoke isolation damper (SSID) opens	Y
		Return smoke isolation damper (RSID) opens	Y
		Exhaust air damper (EAD) opens	Y
		Energize Exhaust fan	
		15 seconds later, supply fan energizes	
		VFD modulates to maintain duct static pressure	Y
	Temperature Control:		
	Cooling		
	Set space dewpoint setpoint below current space dewpoint	Enthalpy wheel speed increases	Y
		CCV modulates to maintain space dewpoint setpoint	Y
	Set space dewpoint setpoint above current space dewpoint	Enthalpy wheel speed decreases	Y
		CCV closes	Y
2	*Heating*		
	Set space temperature setpoint above current space temperature	Enthalpy wheel speed increases	Y
		CCV and HCV modulate to maintain supply air temperature	Y
	Set space temperatuer setpoint below current space temperature	Enthalpy wheel speed decreases	Y
		CCV and HCV close	Y

Functional Test Procedure - Energy Recovery Unit

3	**Heat Recovery Wheel:**		
	Cooling:		
	Set space wetbulb setpoint below current OA wetbulb temperature	Wheel at maximum speed	Y
	Set space wetbulb setpoint above current OA wetbulb temperature	Wheel does not operate	Y
	Heating:		
	Set ERU SA temperature setpoint below current OA temperature	Wheel modulates to maintain ERU SA setpoint	Y
	Set ERU SA temperature setpoint below current OA temperature	Wheel does not operate	Y
4	**Demand Controlled Ventiliation:**		
	Set CO2 setpoint below current CO2 concentration	AHU OAD modulates to max position	Y
	Release setpoint	AHU OAD modulates to min position	Y
	Set CO2 setpoint to less than 100 ppm (or lower)	After 15 minutes, OA damper at max position, CO2 level above setpoint and alarm generated	Y
	Release CO2 setpoint		
2	**Air Flow Control:**		
	Modulate supply and return air static pressure setpoint to below current static pressure value	Supply fan VFD increases	Y
	Modulate supply and return air static pressure setpoint to above current static pressure value	Supply fan VFC decreases	Y

Functional Test Procedure - Energy Recovery Unit

	Building Pressure Control :	Observe exhaust fans match supply fans less pressurization requirement	Y
2	Set building pressure setpoint below current building pressure	Exhaust and supply fans modulate to maintain pressure setpoint	Y
	Set building pressure setpoint above current building pressure	Exhaust and supply fans modulate to maintain pressure setpoint	Y
	Warm Up Mode:		
2	Set builiding in warm-up mode	ERU in unoccupied mode until AHU RA temperatuer reaches 68F	Y
	Cool Down Mode:		
2	Set builiding in cool-down mode	ERU in unoccupied mode until AHU RA temperatuer reaches 75F	Y
	Shutdown:		
	ERU Should	SSID Closes	Y
		RSID Closes	Y
		Exhaust and supply fans deenergize	Y
		OAD Closes	Y
		EAD Closes	Y
	Heating Coil Pump:		
	Set circulation pump enable temperature setpoint above current OA temperature		
		Circulation pump enabled.	Y
	Set circulation pump enable temperature setpoint above current OA temperature		
		Circulation pump disabled.	Y
	24/7 Mode:		
	Command unit to operate in 24/7 mode	Unit in occupied mode at all times	Y
	Outside Air Emergency Shut Off:		
	Activate facility wide emergency outside air shut-off	Unit shuts down	Y
		OA damper closed	Y
		RA damper closed	Y
	Emergency Power Off:		
	Activate facility wide emergency power shut off	ERU shuts down	Y
		OA damper closed	Y
		RA damper closed	Y

Functional Test Procedure - Energy Recovery Unit

	Automatic Shutdown/Reset:		
	Simulate power failure at unit		
		Unit shuts down	Y
	Restore power to unit		
		overloading of electrical distruibution system	Y
	Alarms:		
	Obsereve the following alarms	Freezestat	Y
		High Static Pressure	Y
		Low Static Pressure	Y
		RA Smoke Detector	Y
		SA Smoke Dectector	Y
		Supply fan failure	Y
		Return fan failure	Y
		High SA temperature	Y
		Low SA temperatuer	Y
		High RA humidity	Y
		High filter differential pressure	Y
16	**Safeties:**		
		High SP limit	Y
	Observe the following safeties	Temperatuer low limit	Y
	Duct Smoke Failure:		
		Supply fan disables	Y
	Fail duct smoke detector	Exhaust fan disables	Y
		Damper closes	Y
	Pre Test	Return to Pre Test Setpoints	Y

Functional Test Procedure - Fan Coil Units

Pre-test Checks (Include information listed in parenthesis in numbered boxes below)

1 - Startup reports and construction checklists submitted and approved, equipment ready for testing? (Yes/No)
2 - Controls contractor has documented that all control system functions for this and associated interlocks are programmed and operable per contract documents, including final setpoints and schedules with debugging, loop tuning and sensor calibrations completed. (Yes/No)
3 - All A/E punch list items for this equipment have been corrected? (Yes/No)
4 - Test procedures reviewed and approved by installing contractor? (Yes/No)
5 - Safeties and operating ranges reviewed? (Yes/No)
6 - Current setpoints, control parameters, limits, delays, lockouts, schedules recorded? (Yes/No)
7 - Schedules and setpoints modified? (Yes/No)
8 - False loading equipment, system and procedures ready (boilers, preheat or reheat coils, control loops, over-ride on OSA dampers, etc.) (Yes/No/NA)
9 - BAS parameters, setpoints and logic sequences appear to follow the manufacturer written sequences? (Yes/No)
10 - Packaged control program parameters, setpoints and logic sequences appear to follow the manufacturer written sequences? (Yes/No)

Participants

Company	Name and Role	
CxGBS	Jay Enck (Commissioning)	
Siemens	Chris Wooten	

Date and Time of Testing

Unit ID#	1	2	3	4	5	6	7	8	9	10			
FCU-1	Y	Y	N/A	Y	Y	Y	N	Y	Y	Y			

	Testing Sequence	Expected Response	Unit ID# FCU-1
1	**Occupied Mode:** Set unit in occupied mode.	Unit starts	Y
2	**Occupied Mode:** Set room temperature 5°F above cooling setpoint	Cooling mode starts	Y
		Discharges cool air	Y
3	**Occupied Mode:** Set room temperature 5°F below heating setpoint	Heating mode starts	Y
		Discharges warm air	Y
4	**Condensate Pump:** Set unit in unoccupied mode. Set unit in occupied mode.		
		Condensate pump off	Y
		Condensate pump on	Y
5	**Alarms:** Observe the following alarms		
		Failure to maintian setpoint temperature for 15 mins	Y
		Auxilary pan water sensor	Y
		Local alarm for water sensor	Y
		Supply Fan status	Y
6	**Pre Test**	Return to Pre Test Setpoints	Y

Functional Test Procedure - Misc Equipment BAS Controls

Pre-test Checks (Include information listed in parenthesis in numbered boxes below)

1 - Startup reports and construction checklists submitted and approved, equipment ready for testing? (Yes/No) YES
2 - Controls contractor has documented that all control system functions for this and associated interlocks are programmed and operable per contract documents, including final setpoints and schedules with debugging, loop tuning and sensor calibrations completed. (Yes/No) YES
3 - All A/E punch list items for this equipment have been corrected? (Yes/No) YES
4 - Test procedures reviewed and approved by installing contractor? (Yes/No) YES
5 - Safeties and operating ranges reviewed? (Yes/No) YES

Participants

Company	Name and Role	
CxGBS	Jay Enck (Commissioning)	
Siemens	Chris Wooten	

Date and Time of Testing

	Testing Sequence	Expected Response	Y/N
1	**Builiding Lights:** Observe lighting output	Status reported by BAS is the same as the actual lighting status	Y
2	**Elevator:** Observe the elevator status output	BAS reports NORMAL status when elevator is running normally	Y
		BAS reports TROUBLE status when elevator is in trouble	Y
3	**Elevator Sump Pump:** Observe elevator sump pump status output	BAS reports alarms when sump pump is activated.	Y
4	**Domestic Water Flow Monitoring:** Observe the following Set unit in occupied mode.		
		Domestic Water Meter monitered by BAS	Y
		BAS provides totalization trending of flow readings.	Y
5	**Domestic Water Heater:** Observe domestic water heater status output		
		BAS reports NORMAL status when water heater is running normally	Y
		BAS reports TROUBLE status when water heater is in trouble	Y
6	**Pre Test**	Return to Pre Test Setpoints	Y

Functional Test Procedure - Sewage Ejector Pumps

Pre-test Checks (Include information listed in parenthesis in numbered boxes below)

1 - Startup reports and construction checklists submitted and approved, equipment ready for testing? (Yes/No)
2 - Controls contractor has documented that all control system functions for this and associated interlocks are programmed and operable per contract documents, including final setpoints and schedules with debugging, loop tuning and sensor calibrations completed. (Yes/No)
3 - All A/E punch list items for this equipment have been corrected? (Yes/No)
4 - Safeties and operating ranges reviewed? (Yes/No)
5 - Test requirements and sequences of operation reviewed? (Yes/No)
6 - BAS parameters, setpoints and logic sequences appear to follow the manufacturer written sequences? (Yes/No)
7 - Packaged control program parameters, setpoints and logic sequences appear to follow the manufacturer written sequences? (Yes/No)
8 - Current setpoints, control parameters, limits, delays, lockouts, schedules recorded? (Yes/No)

Participants

Company	Name and Role
CxGBS	Jay Enck (Commissioning)

Date and Time of Testing

Unit ID#	1	2	3	4	5	6	7	8					
SP-1	Y	Y	N/A	Y	Y	Y	Y	Y					

	Testing Sequence	Expected Response	Unit ID# SP-1
1	**Operations (increasing water level):** Fill sump pump pit with water up to LSL Float		
		Lead pump starts and stops	Y
	Fill sump pump pit with water up to LSH Float	Lead pump runs	Y
		Audiable alarm on	Y
	Fill sump pump pit with water up to LSHH Float	Lead pump on	Y
		Lag pump on	Y
		Alarm light on	Y
		Audiable alarm on	Y
2	**Operations (decreasing water level):** Water falls to LSLL float	Lead pump stops	Y
		Lag pump stops	Y
		Audiable alarm and light off	Y
3	**Pre Test**	Return to Pre Test Setpoints	Y

Functional Test Procedure - Sump Pump

Pre-test Checks (Include information listed in parenthesis in numbered boxes below)

1 - Startup reports and construction checklists submitted and approved, equipment ready for testing? (Yes/No)
2 - Controls contractor has documented that all control system functions for this and associated interlocks are programmed and operable per contract documents, including final setpoints and schedules with debugging, loop tuning and sensor calibrations completed. (Yes/No)
3 - All A/E punch list items for this equipment have been corrected? (Yes/No)
4 - Safeties and operating ranges reviewed? (Yes/No)
5 - Test requirements and sequences of operation reviewed? (Yes/No)
6 - BAS parameters, setpoints and logic sequences appear to follow the manufacturer written sequences? (Yes/No)
7 - Packaged control program parameters, setpoints and logic sequences appear to follow the manufacturer written sequences? (Yes/No)
8 - Current setpoints, control parameters, limits, delays, lockouts, schedules recorded? (Yes/No)

Participants

Company	Name and Role
CxGBS	Jay Enck (Commissioning)

Date and Time of Testing

Unit ID#	1	2	3	4	5	6	7	8					
SP-2	Y	Y	N/A	Y	Y	Y	Y	Y					

	Testing Sequence	Expected Response	Unit ID# SP-2
1	**Operations (increasing water level):** Fill sump pump pit with water up to 15% of pit depth	Lead Pump Start	Y
2	**Operations (decreasing water level):** Water falls to 10% of pit depth	Lead pump stops	Y
3	**Pre Test**	Return to Pre Test Setpoints	Y

Functional Test Procedure - VAV w/ Reheat and CO2

Pre-test Checks (Include information listed in parenthesis in numbered boxes below)

1 - Startup reports and construction checklists submitted and approved, equipment ready for testing? (Yes/No)
2 - Controls contractor has documented that all control system functions for this and associated interlocks are programmed and operable per contract documents, including final setpoints and schedules with debugging, loop tuning and sensor calibrations completed. (Yes/No)
3 - All A/E punch list items for this equipment have been corrected? (Yes/No)
4 - Test procedures reviewed and approved by installing contractor? (Yes/No)
5 - Safeties and operating ranges reviewed? (Yes/No)
6 - Current setpoints, control parameters, limits, delays, lockouts, schedules recorded? (Yes/No)
7 - Schedules and setpoints modified? (Yes/No)
8 - False loading equipment, system and procedures ready (boilers, preheat or reheat coils, control loops, over-ride on OSA dampers, etc.) (Yes/No/NA)
9 - BAS parameters, setpoints and logic sequences appear to follow the manufacturer written sequences? (Yes/No)
10 - Packaged control program parameters, setpoints and logic sequences appear to follow the manufacturer written sequences? (Yes/No)

Participants

Company	Name and Role	
CxGBS	Jay Enck (Commissioning)	
Siemens	Chris Wooten	

Date and Time of Testing 9/29/2016

Unit ID#	1	2	3	4	5	6	7	8	9	10			
FCU-G-1	Y	Y	N/A	Y	Y	Y	N	Y	Y	Y			
FCU-G-2	Y	Y	N/A	Y	Y	Y	N	Y	Y	Y			
FCU-2-1	Y	Y	N/A	Y	Y	Y	N	Y	Y	Y			
FCU-2-2	Y	Y	N/A	Y	Y	Y	N	Y	Y	Y			

	Testing Sequence	Expected Response	Unit ID# FCU-G-1	FCU-G-2	FCU-2-1	FCU-2-2
	Occupied Mode:					
	Zone temperature beween occ. Heating and cooling setpoint	Damper at minimum CFM	Y	Y	Y	Y
		Heating is disabled.	Y	Y	Y	Y
1	Zone temperature above cooling setpoint	Damper Increase CFM	Y	Y	Y	Y
		Heating is disabled.	Y	Y	Y	Y
	Zone temperature below heating setpoint.	Damper at minimum CFM	Y	Y	Y	Y
		Heating stages on	Y	Y	Y	Y
	Unoccupied Mode:					
	Zone temperature beween unocc. Heating and cooling setpoint	Damper at minimum CFM	Y	Y	Y	Y
		Heating is disabled.	Y	Y	Y	Y
2	Zone temperature above cooling setpoint	Damper Increase CFM	Y	Y	Y	Y
		Heating is disabled.	Y	Y	Y	Y
	Zone temperature below heating setpoint.	Damper at minimum CFM	Y	Y	Y	Y
		Heating stages on	Y	Y	Y	Y

Functional Test Procedure - VAV w/ Reheat and CO2

3	**CO2 Control:**					
	Set CO2 set point below current CO2 value for 10 mins	TU modulates damper towards full position	Y	Y	Y	Y
	Release setpoint	TU modulates damper towards min position	Y	Y	Y	Y
4	**Morning Warm Up/Cool Down:**					
	Unit in Morning warmup	Damper modulates closed as temperature reaches setpoint	Y	Y	Y	Y
		Boxes to occupied mode once morning warmup conditions are satisfied				
	Unit in morning cooldown					
		Damper modulates to 100% open as temperature reaches setpoint	Y	Y	Y	Y
		Boxes to occupied mode once morning cooldown conditions are satisfied	Y	Y	Y	Y
5	**Pre Test**	Return to Pre Test Setpoints	Y	Y	Y	Y

Functional Test Procedure - VAV w/ Reheat

Pre-test Checks (Include information listed in parenthesis in numbered boxes below)

1 - Startup reports and construction checklists submitted and approved, equipment ready for testing? (Yes/No)
2 - Controls contractor has documented that all control system functions for this and associated interlocks are programmed and operable per contract documents, including final setpoints and schedules with debugging, loop tuning and sensor calibrations completed. (Yes/No)
3 - All A/E punch list items for this equipment have been corrected? (Yes/No)
4 - Test procedures reviewed and approved by installing contractor? (Yes/No)
5 - Safeties and operating ranges reviewed? (Yes/No)
6 - Current setpoints, control parameters, limits, delays, lockouts, schedules recorded? (Yes/No)
7 - Schedules and setpoints modified? (Yes/No)
8 - False loading equipment, system and procedures ready (boilers, preheat or reheat coils, control loops, over-ride on OSA dampers, etc.) (Yes/No/NA)
9 - BAS parameters, setpoints and logic sequences appear to follow the manufacturer written sequences? (Yes/No)
10 - Packaged control program parameters, setpoints and logic sequences appear to follow the manufacturer written sequences? (Yes/No)

Participants

Company	Name and Role	
CxGBS	Jay Enck (Commissioning)	
Siemens	Chris Wooten	

Date and Time of Testing 9/29/2016

Unit ID#	1	2	3	4	5	6	7	8	9	10			
FCU-G-1	Y	Y	N/A	Y	Y	Y	N	Y	Y	Y			
FCU-G-2	Y	Y	N/A	Y	Y	Y	N	Y	Y	Y			
FCU-2-1	Y	Y	N/A	Y	Y	Y	N	Y	Y	Y			
FCU-2-2	Y	Y	N/A	Y	Y	Y	N	Y	Y	Y			

	Testing Sequence	Expected Response	Unit ID# FCU-G-1	FCU-G-2	FCU-2-1	FCU-2-2
	Occupied Mode:					
	Zone temperature beween occ. Heating and cooling setpoint	Damper at minimum CFM	Y	Y	Y	Y
		Heating is disabled.	Y	Y	Y	Y
	Zone temperature above cooling	Damper Increase CFM	Y	Y	Y	Y
1	setpoint	Heating is disabled.	Y	Y	Y	Y
	Zone temperature below heating	Damper at minimum CFM	Y	Y	Y	Y
	setpoint.	Heating stages on	Y	Y	Y	Y
	Unoccupied Mode:					
	Zone temperature beween unocc. Heating and cooling setpoint	Damper at minimum CFM	Y	Y	Y	Y
		Heating is disabled.	Y	Y	Y	Y
	Zone temperature above cooling	Damper Increase CFM	Y	Y	Y	Y
2	setpoint	Heating is disabled.	Y	Y	Y	Y
	Zone temperature below heating	Damper at minimum CFM	Y	Y	Y	Y
	setpoint.	Heating stages on	Y	Y	Y	Y

Functional Test Procedure - VAV w/ Reheat

3	**Pre Test**	Return to Pre Test Setpoints	Y	Y	Y	Y

Functional Test Procedure - VAV without Reheat or VVE

Pre-test Checks (Include information listed in parenthesis in numbered boxes below)

1 - Startup reports and construction checklists submitted and approved, equipment ready for testing? (Yes/No)
2 - Controls contractor has documented that all control system functions for this and associated interlocks are programmed and operable per contract documents, including final setpoints and schedules with debugging, loop tuning and sensor calibrations completed. (Yes/No)
3 - All A/E punch list items for this equipment have been corrected? (Yes/No)
4 - Test procedures reviewed and approved by installing contractor? (Yes/No)
5 - Safeties and operating ranges reviewed? (Yes/No)
6 - Current setpoints, control parameters, limits, delays, lockouts, schedules recorded? (Yes/No)
7 - Schedules and setpoints modified? (Yes/No)
8 - False loading equipment, system and procedures ready (boilers, preheat or reheat coils, control loops, over-ride on OSA dampers, etc.) (Yes/No/NA)
9 - BAS parameters, setpoints and logic sequences appear to follow the manufacturer written sequences? (Yes/No)
10 - Packaged control program parameters, setpoints and logic sequences appear to follow the manufacturer written sequences? (Yes/No)

Participants

Company	Name and Role	
CxGBS	Jay Enck (Commissioning)	
Siemens	Chris Wooten	

Date and Time of Testing 9/29/2016

Unit ID#	1	2	3	4	5	6	7	8	9	10			
VVE 1.1	Y	Y	N/A	Y	Y	Y	N	Y	Y	Y			
VVE 1.2	Y	Y	N/A	Y	Y	Y	N	Y	Y	Y			

	Testing Sequence	Expected Response	Unit ID# VVE 1.1	VVE 1.2
1	**Occupied Mode:** At any zone temperature	Damper at set position	Y	Y
2	**Unoccupied Mode:** At any zone temperature	Damper closed	Y	Y
3	**Pre Test**	Return to Pre Test Setpoints	Y	Y

Calibration Worksheet 4 & 5 OCT 16

Unit/Room #	Sensor	Calibrated Meter Value	BAS Value	Final Offset	Final Value
Mechanical	EBtron RF1	5258	5331	0	5258
	EBtron RF2	5258	5383	0	5383
	EBtron AHU-1	17920	15500		
	EBtron ERU-1	12722	13235		
Mechanical AHU-1	DAT RH	92.9	93.62%		
	DAT	52.8	53.15	-1	52.15
	CC RH	92.7	92.4	0	92.4
	CC T	53.0	54.3	-1	53.3
	MA RH	77.7	72.6	0	72.6
	MA T	57.6	61.6	-4	57.6
	RA RH	61.8	59.1	0	59.1
	RA T	69.5	69.09	0	69.09
Mechanical ERU-1	DAT	53.4	52.56	+1	53.56
	DARH	95.3	98.6	0	98.6
	CCT	49.2	50.67	-1.3	49.37
	CCRH	97.0	94.46	0	94.46
	HCT	Not Read			
	HCRH	Not Read			
	ERWDAT	68.2	71.3	-3	68.4
	ERWDAH	62.9	68.5	-6	62.5
	OAT	69.5	68.86	0	68.86
	OAH	83.6	95.7	-12	83.1
	ERT Entering Ex	70.6	70.81	0	70.81
	ERT Leaving Ex	69.2	69.8	0	69.8
	ERH Entering Ex	59.0	58.62	0	58.62
	ERH Leaving Ex	78.4	83.6	-5.2	78.4
IT room	CRAC 1 T	69.9	69.9	0	69.9
	CRAC 1 RH	66	66	0	66
	CRAC 2 T	67.8	69	-1	67.8
	CRAC 2 RH	56.7	55.6		55.2
Elevator rm	FCU T	74.7	72	+2.7	74.7
Basement	TU1.1 T	67.9	67.25	0	67.25
	TU1.1 CO2	457	438	0	438
	TU1.2 T	67.9	67.25	0	67.25
	TU1.2 CO2	457	438	0	438
	TU1.3 T	67.9	67.25	0	67.25
	TU1.3 CO2	457	438	0	438

Calibration Worksheet 4 & 5 OCT 16

Unit/Room #	Sensor	Calibrated Meter Value	BAS Value	Final Offset	Final Value
	TU1.4 T	67.9	67.25	0	67.25
	TU1.4 CO2	457	438	0	438
	TU1.5 T	69.9	69.75	0	69.75
	TU1.5 CO2	400	426	0	426
	TU1.6 T	69.7	69.25	+0.5	69.75
	TU1.7 T	69.8	68.5	+1.25	69.75
	TU 1.8 T	70.0	69.75	+0.25	70
	TU 1.9 T	70.3	72.3	-2	70.3
	TU1.10 T	68.1	68.75	-0.75	68.0
1st Floor	TU 2.7, 2.8, VVD 1 + 2 T	71.0	70.25	+0.75	71.0
	TU 2.7, 2.8, VVD 1 + 2 RH	61.8	69.2	0	68.2
	TU 2.7, 2.8, VVD 1 + 2 CO2	443	453	0	453
	TU 2.6 T	71.8	69.75	+2	71.8
	TU 2.6 RH	61.8	59.1	0	59.1
	TU 2.6 CO2	453	477	0	477
	TU 2.3 T	71	70	+1	71
	TU 2.3 RH	61.8	67.3	0	67.3
	TU 2.3 CO2	480	458	0	458
	TU 2.9, 2.10 T	70.7	69	+1	70.0
	TU 2.9, 2.10 RH	61.8	66.4	0	66.4
	TU 2.9, 2.10 CO2	443	477	0	477
	TU 2.4, 2.5 T	71	70.9	0	71
	TU 2.4, 2.5 RH	61.8	67.3	0	67.3
	TU 2.4, 2.5 CO2	480	458	0	458
	TU 2.1, 2.1, 2.11, 2.12 T	70.7	70.1	0	70.1
	TU 2.1, 2.1, 2.11, 2.12 RH	61.8	66.4	0	66.4
	TU 2.1, 2.1, 2.11, 2.12 CO2	443	477	0	477
Outside	OA CO2	413			

PROJECT:	**US Diplomacy Center**
PREPARED FOR:	GSA
PREPARED BY:	H J Enck
COPIES:	Heery, CxGBS
REPORT DATE:	12/23/2014

CxGBS was present to perform job site observations on 2 Dec 14. CxGBS learned that contractors were working to complete subterranean and the anticipated installation of below grade waterproofing would probably start in early February 2015 from the construction manager. CxGBS discussed our concerns regarding installation of waterproofing materials during the winter months with sub-freezing temperatures anticipated during installation. Based on this observation, CxGBS recommends that waterproofing materials which are suitable for installation in temperatures as low as 25°F be selected and submitted to the team for review and approval to minimize the risk of waterproofing not meeting the project requirements.

During the site visit CxGBS recommended that a pre-construction meeting take place relative to below grade water proofing to allow review and discussion related to installation and observation of subterranean water proofing systems and materials.

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Commissioning & Green Building Solutions, Inc.

COMMISSIONING FIELD REPORT #1

PROJECT: **U.S. Diplomacy Center**

PREPARED FOR: GSA

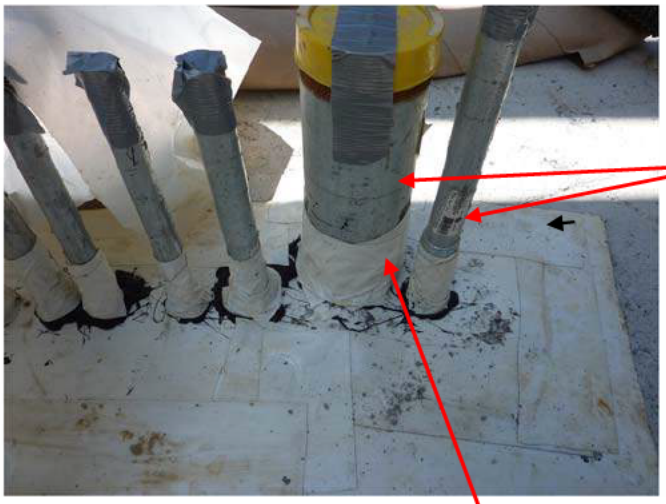
PREPARED BY: H. Jay Enck

COPIES: DOS

REPORT DATE: 16 July 2015

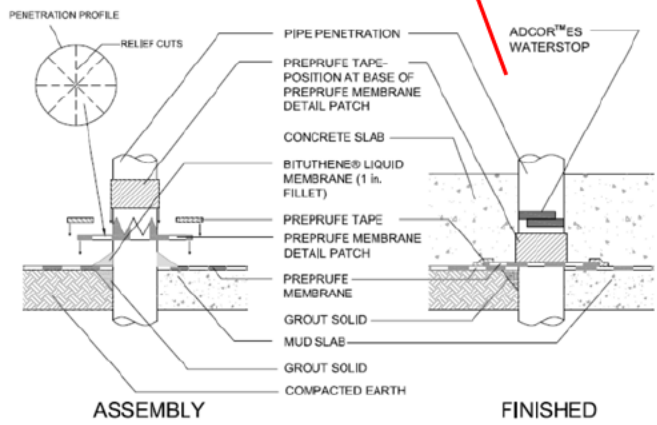
CxGBS conducted job site observations on 10 July 15.

Observations:



Issue # 1

Typical basement waterproofing of electrical conduit missing ADCOR ES waterstop.



Issue # 2
Under mud slab drainage piping is more than 50% below top of grade beam.

Issue # 3
Gravel drainage bed appears to be a mixture of gravel and soil which does not meet spec section 31 000 drainage course requirements for a clean drainage course.

Issue # 4
Waterproofing installation does not conform to manufacturer's installation instructions. Waterproofing should have been installed below the column footing or on the column footing below the column end plate in accordance with manufacturer's instructions. As installed waterproofing integrity is unlikely.

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COMMISSIONING FIELD REPORT #2

PROJECT:	**U.S. Diplomacy Center**
PREPARED FOR:	GSA
PREPARED BY:	H. Jay Enck
COPIES:	DOS
REPORT DATE:	17 August 2015

CxGBS conducted job site observations on 12 August 15.

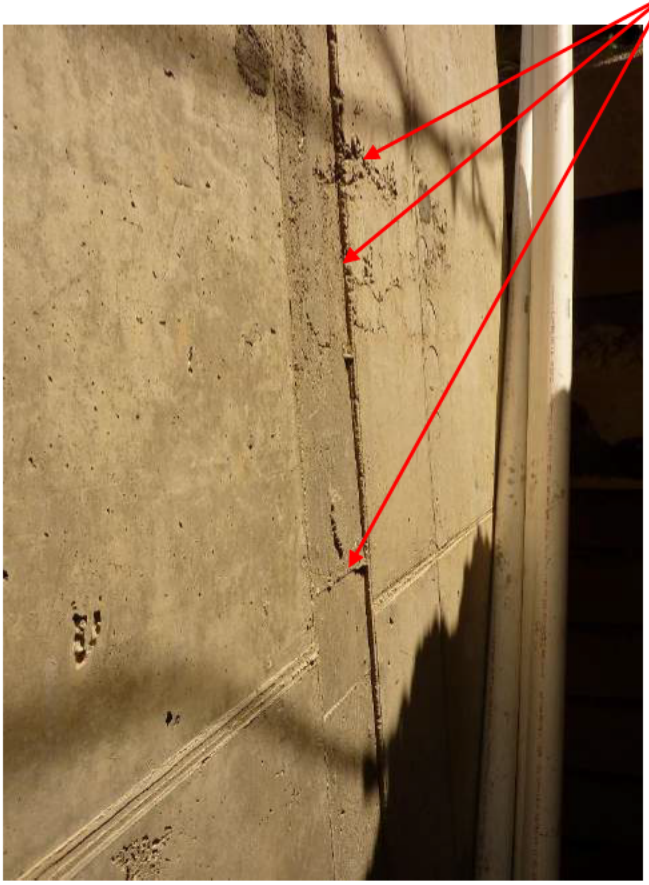
Observations:

Issue # 5

Southeast corner requiring patching to provide a smooth surface prior to application of Bituthane membrane. Patch mortar, or grout and trowel smooth in accordance with manufacturer's installation instructions.

Issue #6

Trim edge protrusions or feather with mortar or grout to provide smooth installation surface for Bituthane membrane. Remove protrusions that will hinder the adhesion or regularity of membrane installation.



Issue # 7
East wall at southeast corner requiring patching to provide a smooth surface prior to application of Bituthane membrane. Patch mortar, or grout and trowel smooth in accordance with manufacturer's installation instructions.

Issue # 8
In isolated locations where concrete surface primer is no longer tacky reapply primer in accordance with manufactures instructions.

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COMMISSIONING FIELD REPORT #3

PROJECT:	**U.S. Diplomacy Center**
PREPARED FOR:	GSA
PREPARED BY:	H. Jay Enck
COPIES:	DOS
REPORT DATE:	3 September 2015

CxGBS conducted job site observations on 28 August 15.

Observations:

Issue # 9

Sealant primer being applied along grid line PC of mechanical room B101 not extending width of sealant being applied. Recommend installing contractor apply primer slightly beyond full with of sealant being applied. Observed contractor correct and apply primer as recommended by manufacture. Request installation foreman increase diligence in installing waterproofing materials per manufacturer.

Issue #10

Previous Issue #7 not addressed during construction. Recessed area in concrete requires filling to provide smooth surface to prevent voids that hinder good adhesion as shown in temporary application of Bituthene. Recommend prior to next application of sheet waterproofing troweling smooth depressions and protrusions per manufacture installation instructions

Issue # 11
Numerous areas were observed in the basement floor not ready for lapping of Preprufe waterproofing membrane. Ensure the underside of the succeeding sheet is clean, dry and free from contamination before attempting to overlap. See manufacture's installation instructions

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Commissioning & Green Building Solutions, Inc.

COMMISSIONING FIELD REPORT #4

PROJECT:	**U.S. Diplomacy Center**
PREPARED FOR:	GSA
PREPARED BY:	H. Jay Enck
COPIES:	DOS
REPORT DATE:	28 September 2015

CxGBS conducted job site observations on 25 September 15.

Meetings:
A meeting between Bennett Varghese/DOS, Warren (Keith) Jones/Heery, Michael Garner/Gilbane, and H. Jay Enck/CxGBS to discuss Gilbane's QC Plan was conducted to review revisions requested to be included in the QC plan. Comments previously provided to Gilbane's "Project Specific Quality Plan" (QC Plan) dated June 23, 2014 and subsequent correspondence was discussed. The meeting focused on inclusion of Commissioning activities in Gilbane's plan, not previously included. As a result of the meeting Michael Garner/Gilbane agreed to incorporate most of the references to the commissioning process in Gilbane's QC Plan.

During the meeting it was discussed that communications needed to be improved to allow better coordination of the commissioning activities. Gilbane agreed to notify the CxA through the CM Heery when initial inspections of work were ready to be performed. This includes work first assembled or installation and to provide notification at least 72 hours prior to the work on systems being commissioned that are ready for observation. These systems are defined in the projects specifications which also includes the Commissioning Plan (Cx Plan).

It was also discussed that the commissioning checklists included in the specifications, and required by both specifications and the Cx Plan to be updated weekly. Copies of the checklists shall be provided to the CxA, filled out by contractor personal having direct knowledge of the work completed which is generally the trade foreman. Gilbane will provide checklists updated weekly by each trade foreman working on systems being commissioned for CM and CxGBS review per specifications. Prior to notification the CxA through the CM that a systems or assembly being commissioned is ready for testing Gilbane shall provide a signed commissioning checklist prior to scheduling the CxA to direct, witness, and document testing defined by specification. CxGBS indicated no testing will be scheduled without signed commissioning checklists.

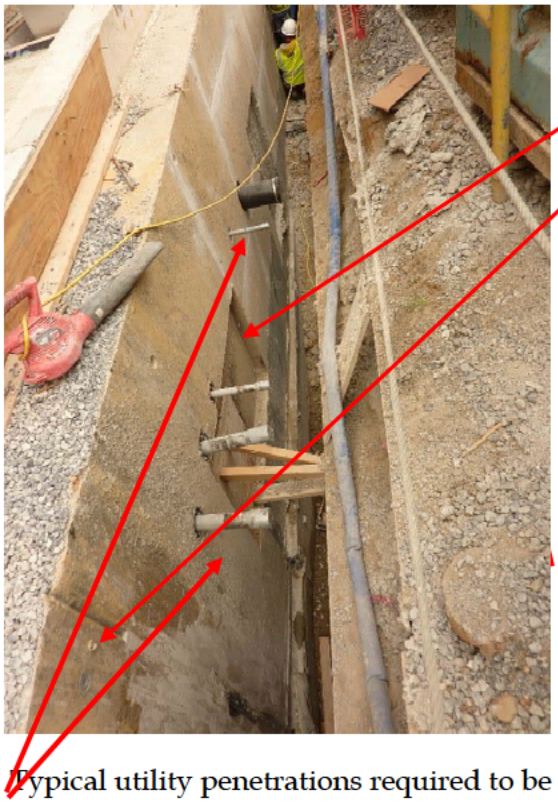
CxGBS indicated that Gilbane input was needed to update the commissioning plan schedule as the previous schedule has not been meet. The team discussed scheduling meetings to better coordinate construction and commissioning activities. CxGBS will provide a suggestion to GSA for their consideration to facilitates additional site visits and meetings. CxGBS indicated, in accordance with project specifications, that utility penetrations through the subterranean waterproofing are to be tested. Gilbane is to provide CxA notification through the CM when

they will be ready to begin testing of these penetrations. CxGBS indicated that these test shall be included in the project two week look ahead and project schedule as required by specification.

No commissioning checklists have been received as of September 28, 2015 from Gilbane for work already completed as required by specification. Gilbane acknowledged this deficiency and indicated the commissioning checklists are forth coming.

The meeting attendees agreed to step up coordination between construction and commissioning to improve collaboration in the delivery of the project and meeting the owner's expectations.

Observations:



Typical utility penetrations required to be tested after installation of sheet waterproofing. Contractor to provide estimated time when penetrations on all subterranean walls are ready for acceptance testing. Minimum cure time of 24 hours is required before testing can occur.

Issue # 12

Contractor is in process of filling in prepping the concrete substrate in preparation of applying sheet waterproofing. Several areas with gaps larger sheet water proofing can span still require to be filled in.

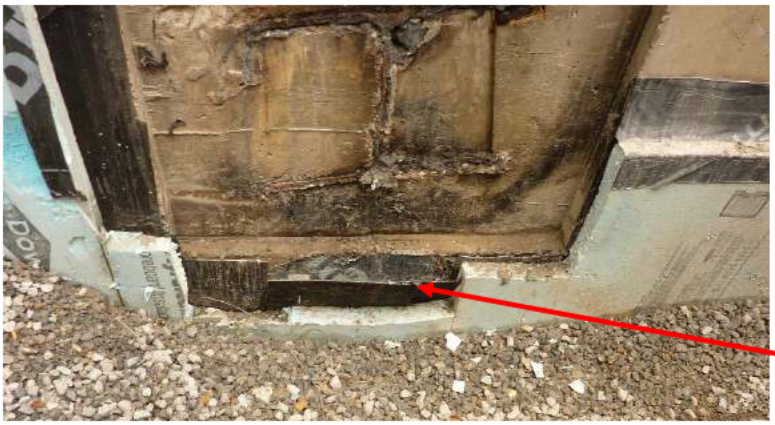
Prior to reapplication of waterproofing primer on concrete substrate the substrate must be free from spalled areas, loose aggregate, sharp protrusions or other matter that will hinder the adhesion or regularity of the membrane installation. The surface should also be free from frost, dirt, grease, oil or other contaminants as outlined in the manufactures installation instructions.

Issue #13

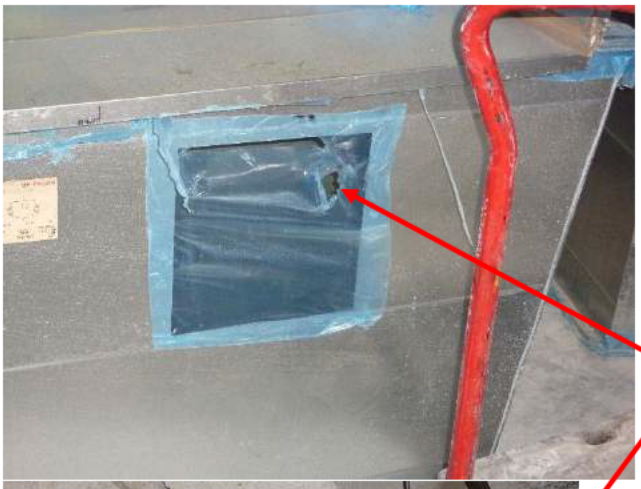
Typical condition to Issue #12 instructions. Patch rough wall areas with mortar, grout or approved sealant. Remove fins and form match lines.

Issue # 14

Copper pipe should not be in direct contact with concrete. Wrap pipe with polymer material inside wall assembly. To prevent early degradation of pipe.



Issue #15
Damaged waterproofing requiring repair with a minimum 6″ lap over existing membrane.



Issue #16
Duct protective seal broken requiring repair in accordance with Construction IAQ requirements. Protection of electrical equipment from dirt and debris that can affect transformer's ability to cool properly.

Issue # 17
Insufficient space to properly insulate ductwork and maintain insulation value and vapor barrier integrity.

Issue #18
Insufficient space to allow insulation installation.

Insulation cannot be installed over duct hangers and spacers are required between duct and hanger to prevent compromising insulation value and damage to vapor barrier.

Issue # 19 Contractor not utilizing commissioning checklist as work progresses as required by specification.

Issue #20 Work required to have a completed Commissioning Checklist filled out and signed by contractor personal having direct knowledge of the work completed (trade foreman) have not been received for work that has been completed as of 25 Sept. 15.

Issue #21 GC has not included commissioning activities in their project schedule or in their two week look ahead. Commissioning is a team sport and requires scheduling and project team cooperation as outlined in specifications.

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151015 COMMISSIONING FIELD REPORT #5

PROJECT:	**U.S. Diplomacy Center**
PREPARED FOR:	GSA
PREPARED BY:	H. Jay Enck
COPIES:	DOS, Gilbane, BBB
REPORT DATE:	15 October 2015

CxGBS conducted job site observations on 14 October 15 and participated in Executive Committee meeting.

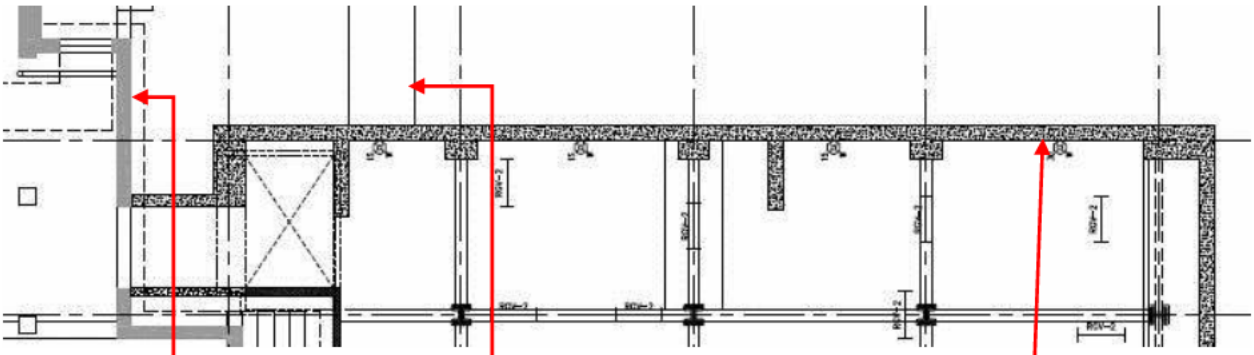
Meeting:
Representatives from DOS, GSA, BBB, Gilbane, and Heery attended the executive meeting. During the meeting the issue with FRP exhaust from ERU-1 was discussed. Gilbane presented that the rerouting of the FRP exhaust duct would impede construction as they interpreted that the FRP duct exhaust is required for HVAC operation needed to condition USDC for installation of finishes. CxGBS suggested that the HVAC system could be operated without exhausting air during the construction phase by allowing the HVAC to exfiltrate air through the doors on the east entrance, thus minimizing/eliminating any delay associated with rerouting of the FRP. CxGBS suggested Gilbane discuss this with the mechanical contractor and if needed obtain direction from designer.

At the conclusion of the Executive meeting CxGBS brought up the long standing issue regarding the roof drains not being insulated from the roof gutter through the transition of the top of the structural steel. The thermal bridge created by the piping not being completely insulated, in CxGBS' opinion condensation will occur at each roof drain location. The main issue is insufficient clearance to allow installation of insulation to a thickness required to control condensation from occurring on the surface of the stormwater piping as it transitions from gutter over top of structural steel. Heery and BBB indicated that the roof drain issue would be revisited immediately as the lower roof is currently in construction.

After the Executive Committee meeting CxGBS meet with Gilbane and Heery to discuss better coordination of the commissioning process and communication including commissioning activities in the two week look-ahead spreadsheet, utilizing construction checklists and issues log. Gilbane agreed to providing responses and updates regarding action and or disposition of resolving issues in the commissioning issues log on a weekly basis. In addition, Gilbane agreed to send construction checklists from the trade foreman confirming installation practices being carries out in the field meet manufacture and or industry standards and guidelines. When installing contractor has checked 100% of their installation the installer will sign the construction checklist confirming that the system or assembly is ready for testing as required in the specifications.

Testing:

Locations of North Wall Below Grade Penetrations Tested



Fire Line Penetration

FRP Penetration

Storm drain Penetration

Testing

Utilizing a modified AAMA 501.2 testing procedure each of the three penetrations were tested with no evidence of water intrusion through the below grade assembly. The both the storm drain and fire line penetrations were tested for a duration of 15 minutes each. The FRP penetration was tested for 45 minutes.

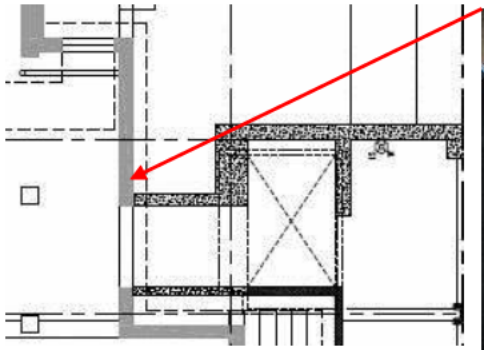
Observations:

Issue #22

Additional sections of ductwork were observed during the site visit as not being protected as required by specification.

Issue #23

Waterproofing at intersection of USDC north below grade wall and Harry S. Truman east wall not correctly terminated in accordance with waterproofing manufacture installation procedures.



Recommend installing termination bar and Bituthene mastic or liquid membrane to secure and seal vertical edge of Bituthene sheet.

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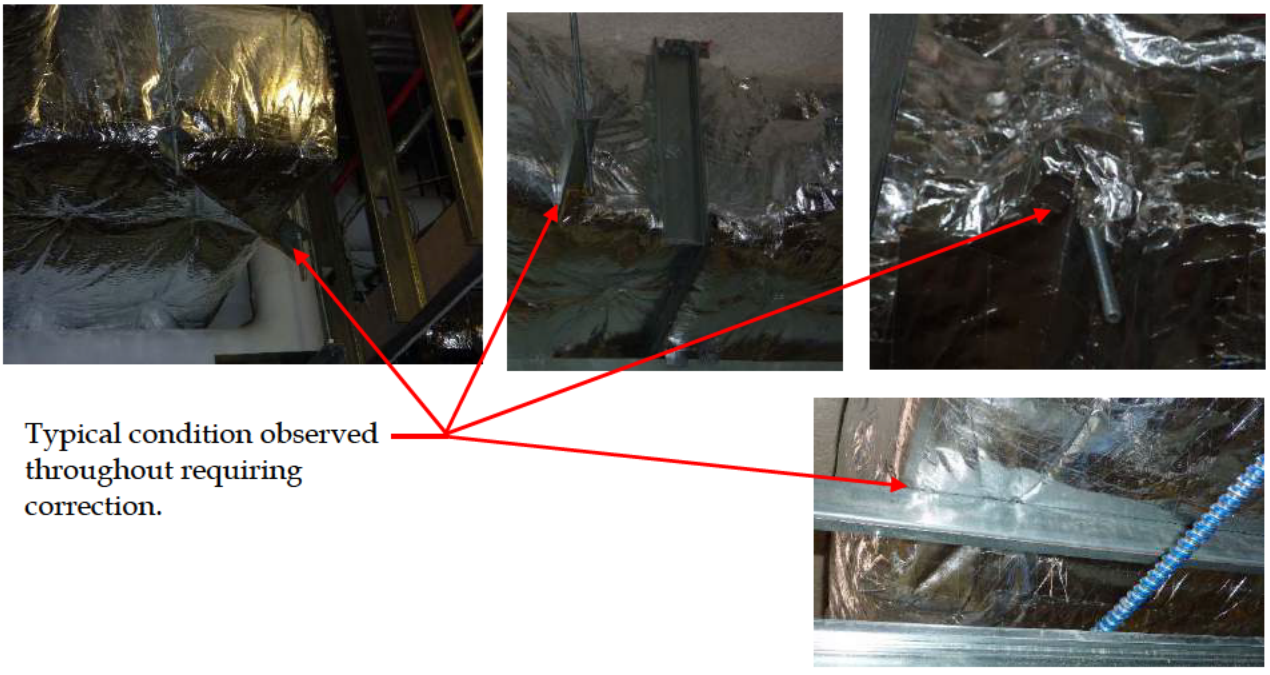
151221 COMMISSIONING FIELD REPORT #6

PROJECT:	**U.S. Diplomacy Center**
PREPARED FOR:	GSA
PREPARED BY:	H. Jay Enck
COPIES:	DOS, Gilbane, BBB
REPORT DATE:	18 December 2015

CxGBS conducted a scoping meeting conducted job site observations on 18 December 15.

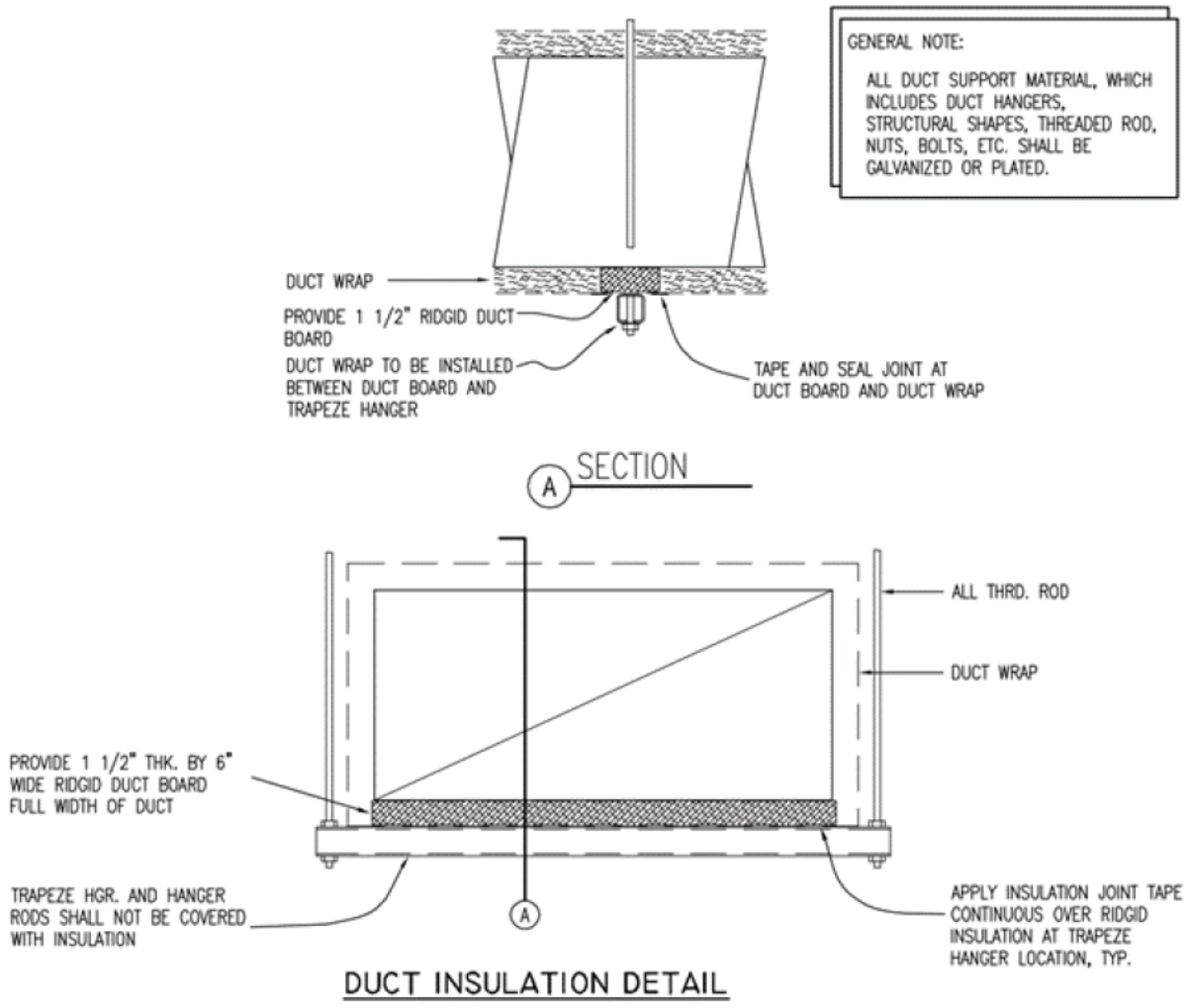
Scoping Meeting:
Representatives from DOS, GSA, Gilbane, Heery, and mechanical, below grade waterproofing, and curtainwall contractors attended the commissioning scoping meeting. During the meeting the commissioning process was reviewed, communication protocols were established, required deliverables were highlighted and the timing of receiving the commissioning deliverables were partially established. Due to the unknowns associated with completion of the FRP duct the timing of the TAB contractor to perform their work was in question. Several general dates were established for testing of the building enclosure. The requirement for completion of commissioning checklists signed by the various contractors to be sent to the CxA prior to scheduling testing was reiterated. Gilbane offered to update the CxPlan schedule of activities to match construction progress.

Observations:
Issue #24
Incorrect installation of insulation of HVAC ducts were observed throughout. Duct hangers cannot be insulated around. Integrity of insulation and vapor barrier must be maintained.



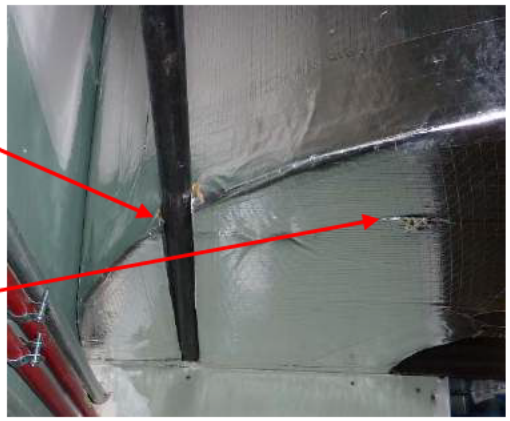
Typical condition observed throughout requiring correction.

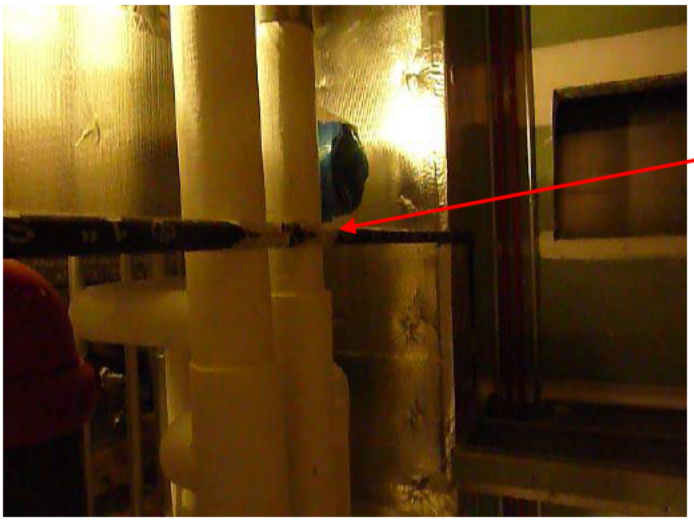
Suggested Installation Detail



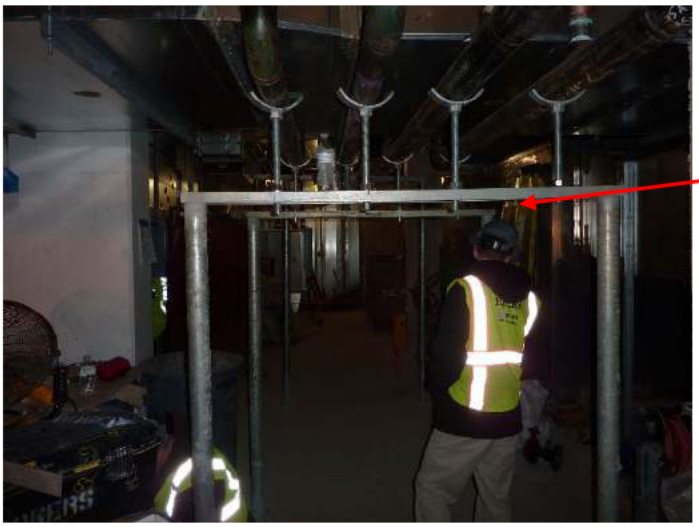
Issue #25
Duct insulation cannot be removed to allow installation of other infrastructure. Condition observed in several isolated areas requiring correction.

Issue #26
Breaches in vapor barrier observed throughout. All breaches must be sealed.





Issue #25 Continued
Pipe insulation cannot be removed to allow installation of other infrastructure. Condition observed in several isolated areas requiring correction.



Issue #27
HVAC Pipe Bridge poses physical hazard to building operators due low height and need head clearance.

Issue #28
Insufficient clearance and spacing to allow correct installation of flex duct to floor diffusers above which will add additional static pressure to HVAC system.

Issue #29
Flexible duct collar does not have bead required by SMACNA to provide a stop for Panduit strap that will be used to fasten flex duct. Bead is required to prevent slippage of tie so flex duct does not becoming separated.

Serving the Life of Your Building
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160311 COMMISSIONING FIELD REPORT #7

PROJECT: **U.S. Diplomacy Center**

PREPARED FOR: GSA

PREPARED BY: H. Jay Enck

COPIES: DOS, Gilbane, BBB

REPORT DATE: 11 March 2016

CxGBS conducted job site observations and testing of the skylight and curtain wall starting from 1:30 PM till 4:30 PM on 9 March 16 and continuing from 10 AM till 5:30 PM on 10 March 16. Weather conditions during site visits: Outside Temperature: high 60s°F to high 70s°F, Sky Condition: Clear, Site Condition: Dry.

CxGBS assisted by Ferguson Neudorf (FN) and Gilbane (GCC) conducted flood testing of all skylight (upper roof) gutters, AAMA 501.2 testing on 25% of the sky light area, sealant pull tests on curtainwall and skylight sealants and conducted observations of the building enclosure construction and above ceiling in the basement area. The no water intrusion was observed from the gutter flood tests. AAMA 501.2 testing resulted in two areas of water intrusion.

The 1st area of water intrusion through the upper roof assembly was observed at the intersection between the skylight and parapet along the north parapet. Heery, GCC and FN reported that the assembly at the intersection of the skylight and parapet was not complete. Based on this information CxGBS limited testing to the skylight assembly and upper roof gutters only. However, based on detailed examination of the FN shop drawings and onsite observations there appears to be a breach or discontinuity in the waterproofing membrane that transitions from the gypsum substrate to the gutter (See Issue# 24). On the 2nd day of testing water intrusion was also observed on the southeast corner of the skylight. The leak is determined to be coming from a breach in the air barrier (See Issue 25).Further investigation by FN is required to determine the exact path of water intrusion.

The issue of condensation forming on the interior of the building from the lower roof drain has been raised during design reviews and throughout construction but does not appear to have been resolved (See Issue# 26). CxGBS strongly recommends that this issue we resolved prior to installing interior ceilings.

CxGBS observed discontinuity of the Thermal/Air/Water barriers at the intersection of the curtainwall and building foundation (See Issue# 28) which will affect building comfort, ability to pressurize the building properly, and control moisture with the building interior. CxGBS recommends adding insulation and sealing the area between the curtain wall and foundation.

There are still numerous issues in the above ceiling in the basement which are pervasive throughout and require correctoion before closing basement ceilings (See Issues#29 through 35)

Building Enclosure Observations & Testing:

Area of water intrusion on 9 Mar 2016

Shaded areas indicate portions of skylight tested during the site visit.

Testing – CxGBS Field Test No. 03, Roof and Roof Drain Test

Area of water intrusion on 10 Mar 2016

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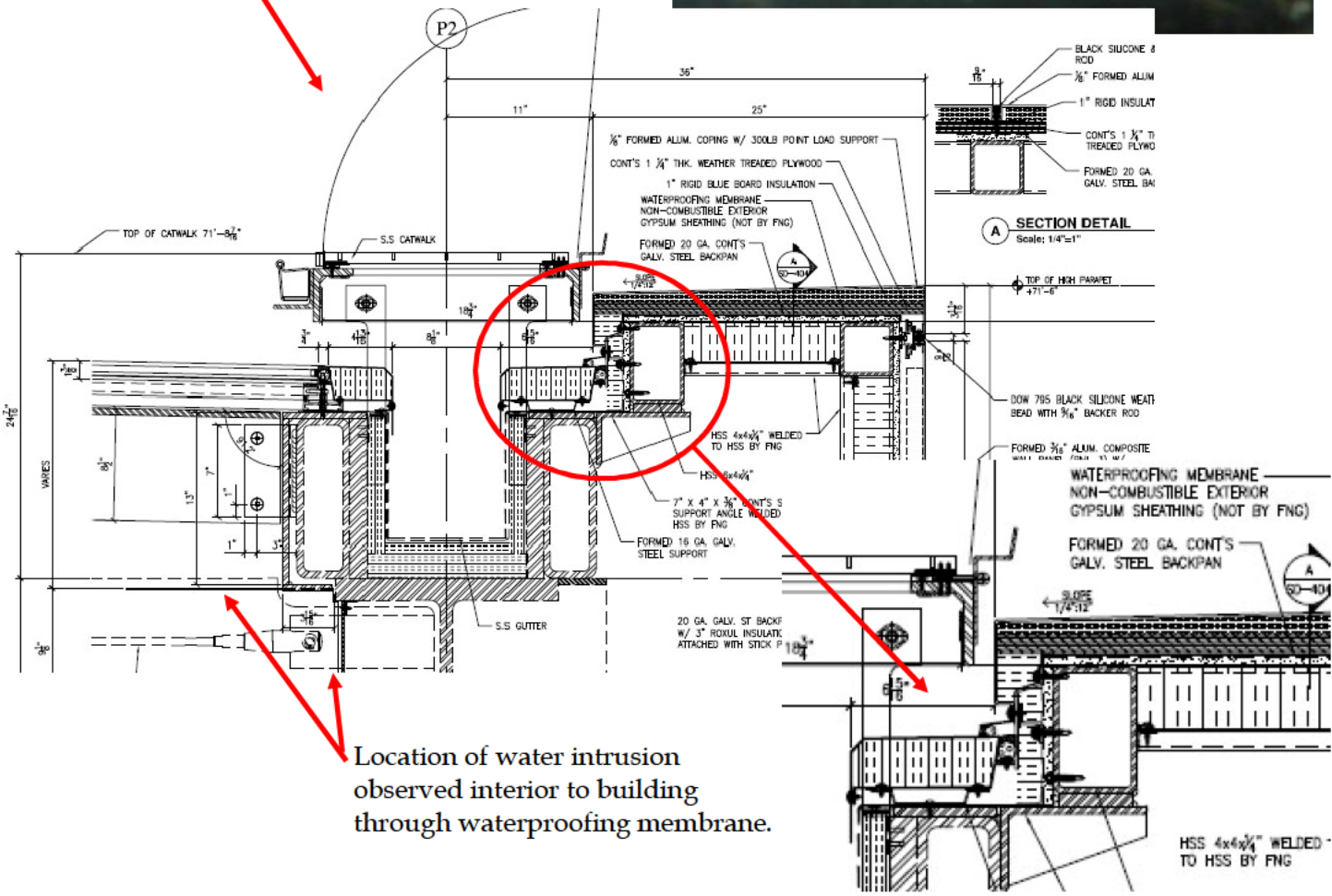
Issue #24
Locations of water observed in interior below north skylight parapet wall

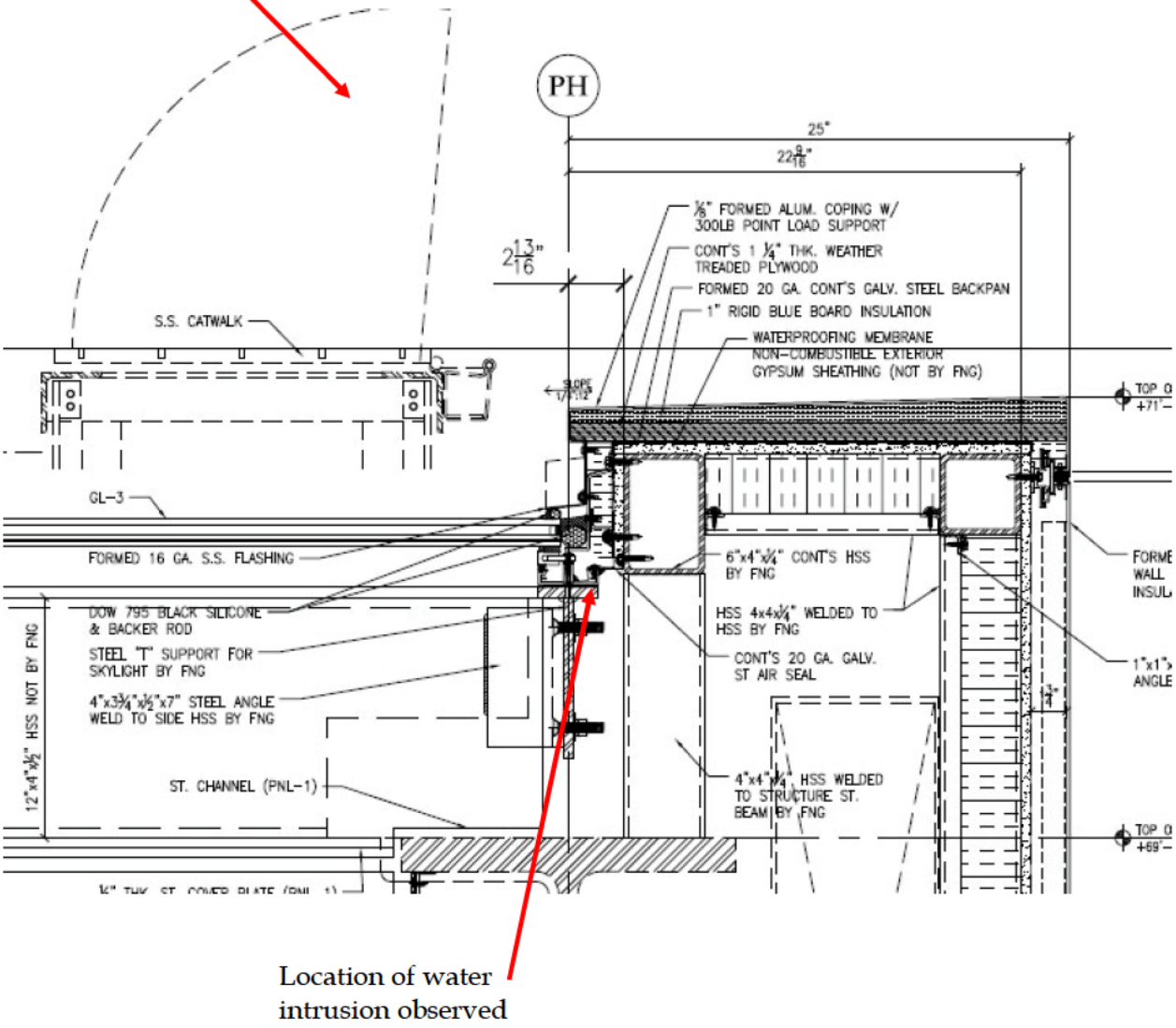
FN Detail 404



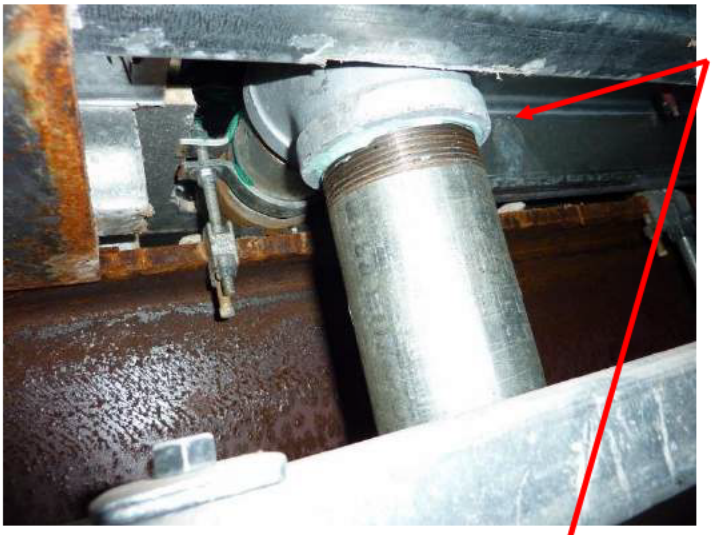
Location of water intrusion observed interior to building through waterproofing membrane.

Issue #25
Location of water intrusion observed below skylight southeast corner.

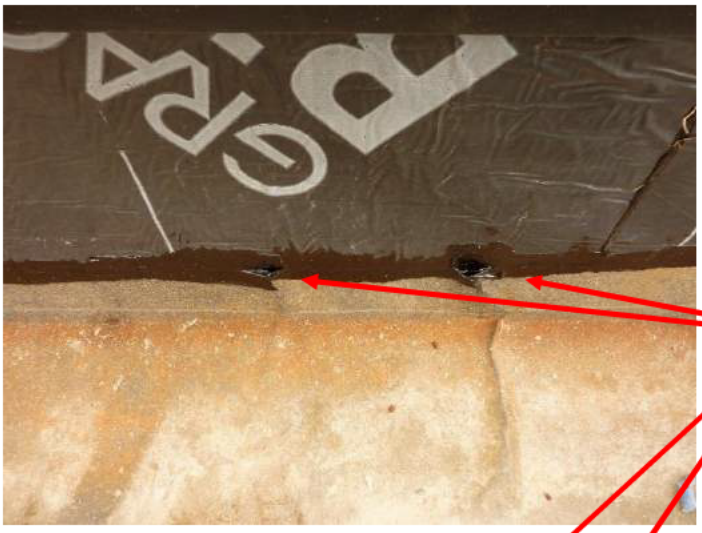
FN Detail SD-401



Location of water intrusion observed



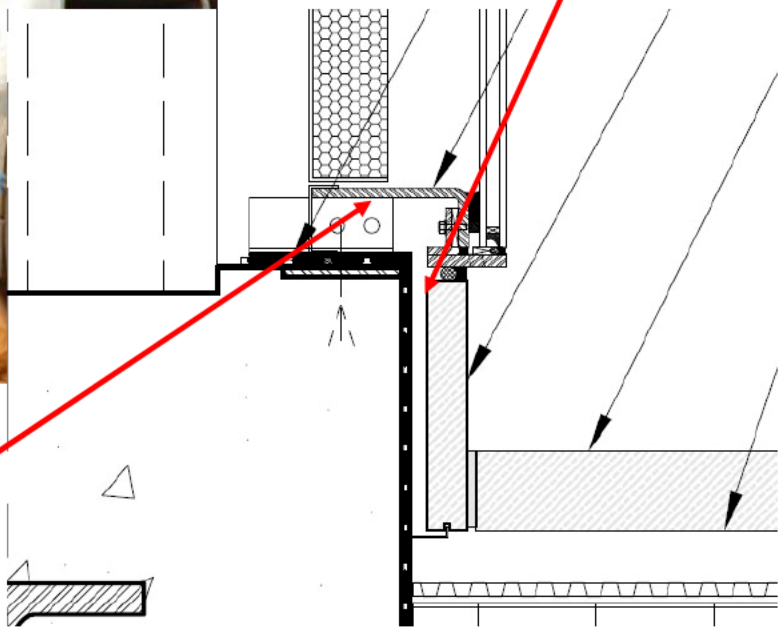
Issue #26 Lower roof drain
As designed and installed there does not appear to be a way the assembly can either insulated or isolated to adequately prevent or control condensation from forming on the assemblies exterior and water dripping from the assembly to the ceiling below.



Issue #27
Multiple breaches observed in waterproofing along South Foundation requiring correction.

Issue #28
There is a breach in the air/water/thermal barriers between insulated Curtain Wall and the foundation of the US Diplomacy Center.

Design documents <u>does not</u> indicate that the foundation edge above grade will be insulated which will result in condensation during winter months to form within the interior wall assembly.

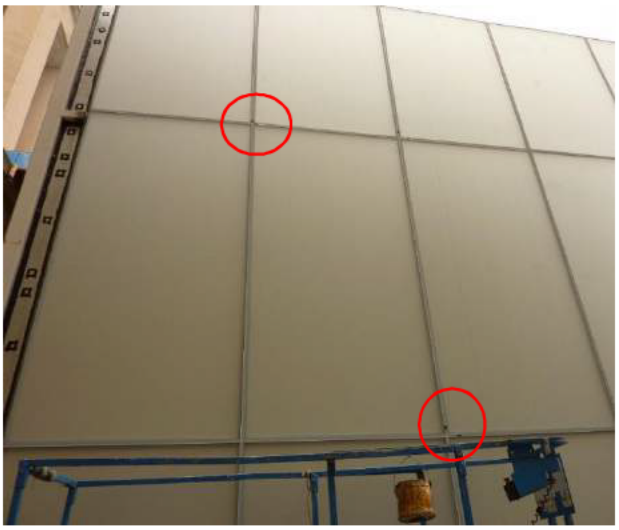


In addition stainless steel support for the curtain wall is a thermal bridge through the assembly to the building interior.

Interior view illustrating lack of thermal insulation and discontinuity of air/water barrier

Observations

Ten separate locations of sealant pull tests were conducted to evaluate quality of sealant installation, continuity of backer rod support, thickness, and strength of adhesion. Eight of the locations were on the curtainwall assemblies and two on the upper roof skylight. No installation issues identified. Contractor appears to have done a great job preparing the surfaces and installing the sealants.



MEP Observations:

Issue #29
Above ceiling in basement.

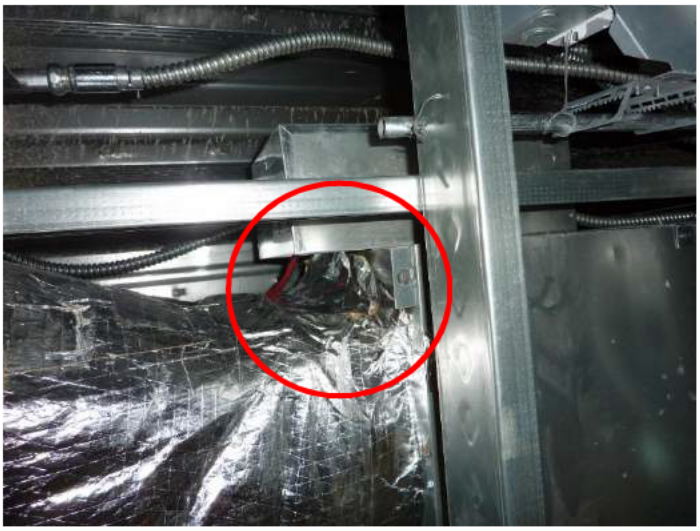
Continuous vapor barrier not provided through wall opening.

Provide continuous insulation and vapor barrier surrounding all duct sections and through all wall penetrations.

Issue #30
Above ceiling, issue is pervasive throughout project.

Vapor barrier not properly sealed.

Completely seal vapor barrier per manufacturer's requirements throughout project. Issue must be corrected prior to closing ceilings.



Issue #31
Above ceiling, issue is pervasive throughout project.

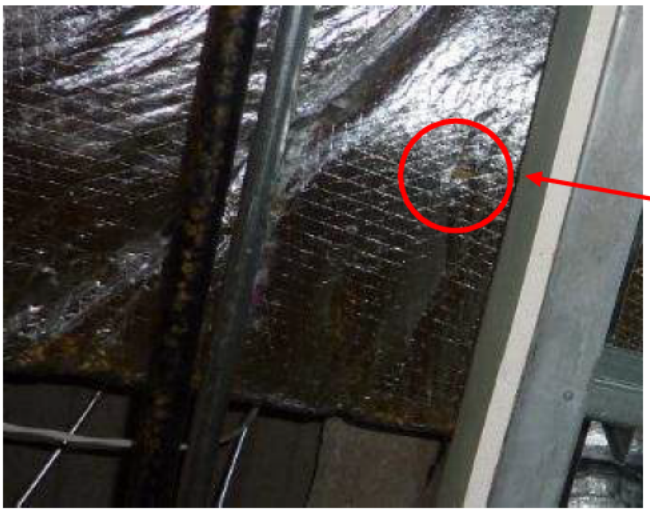
Vapor barrier not properly sealed.

Completely seal vapor barrier per manufacturer's requirements throughout project. Issue must be corrected prior to closing ceilings.

Issue #32
Above ceiling, issue is pervasive throughout project.

Vapor barrier not properly sealed.

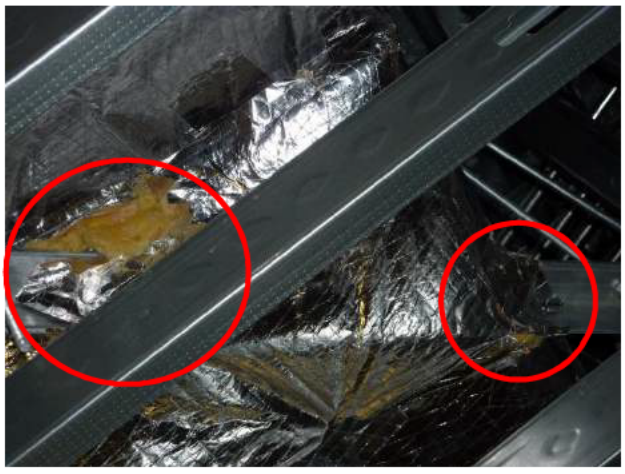
Completely seal vapor barrier per manufacturers requirements throughout project. Issue must be corrected prior to closing ceilings.



Issue #33
Above ceiling, issue is pervasive throughout project.

Support structure penetrating vapor barrier, penetrations not properly sealed.

Properly seal all vapor barrier penetrations per manufacturer's requirements throughout project. Issue must be corrected prior to closing ceilings.



Issue #34
Above ceiling, issue is pervasive throughout project.

Support structure penetrating vapor barrier, penetrations not properly sealed.

Properly seal all vapor barrier penetrations per manufacturer's requirements throughout project. Issue must be corrected prior to closing ceilings.

Issue #35

Flex duct connection not properly sealed.

Properly seal all duct connections per manufacturer's requirements throughout project. Issue must be corrected prior to closing ceilings.

COMMISSIONING/LEED ISSUES RESOLUTION LOG

Project: U.S. Diplomacy Center # 120103 **Date Last Revised: 4/25/2018**

Issue #	Issue	Date Found	Recommendations	Designer Direction	CM Comments	GC Actions Taken	Cx Comments	Date Resolved
1	Typical condition observed waterstop missing from electrical conduit penetrating basement slab	7/10/15	Install waterstop in accordance with manufacture instructions.		Waterstop around SOG penetrations was eliminated per RFI 324. (BIM Issue # QC 029)	Waterstop detail was fully complied with according to manufacturer instructions. Waterstop was eliminated.	Closed	9/29/15
2	Subsurface drainage piping not at correct elevation.	7/10/15	Relocate drainage piping per design documents		Subsurface drainage piping crossed over grade beams and where it crossed over these grade beams the piping is 100% on top of the grade beam. Drainage pipe that was over 50% below was brought up closer to surface.	Drainage piping was installed at design elevation, except where crossing or routed on top of grade beams, where elevation was necessarily higher than typical detail depiction.	Closed	9/29/15
3	Gravel drainage bed does not meet design specification requirements	7/10/15	Modify installation to be in accordance with specification for subsurface drainage field		The dirt mixed in with the #57 stone around the PI-PK/ P2-P3 was removed from the site and new #57 stone backfill was added in this area (BIM Issue # QC 032)	Gravel drainage bed was installed per design, with congested areas being removed and refreshed.	Closed	9/29/15
4	Column waterproofing detail does not conform to manufacture recommendations.	7/10/15	Manufacturer's penetration detail may option. Provide letter from manufacture illustrating appropriate waterproofing detail recommend to correct deficiency.		Concur that column detail was submitted by Grace on 8/18/15 and no exceptions were taken by BBB and CxGBS. Column waterproofing was installed as per submitted detail. (BIM Issue # QC 026)	W.R.Grace detail was forwarded, and installed accordingly.	Closed	9/29/15
5	Honeycomb section of concrete wall southeast corner requiring repair in preparation of waterproofing installation	8/12/15	Provide smooth surface prior to installation of Bituthane membrane using mortar or grout patch troweled smooth		Concrete patching material was applied over southeast corner area to smooth out rough edges prior to application of bituthene membrane.	All concrete surfaces have been and will continue to be prepared smoothly in accordance with manufacturer requirements.	Closed	9/29/15
6	Protrusions requiring removal or feathering to provide smooth surface for installation of Bituthane membrane	8/12/15	Provide smooth surface prior to installation of Bituthane membrane using mortar or grout patch troweled smooth		Heery monitored edge penetrations prior to application of the waterproofing membrane and verified sharp edges that may puncture the waterproofing membrane were patched prior to application of membrane.	Concrete profile has been prepared smooth in accordance with manufacturer requirements.	~~As not all corrections have been complete issue will remain open~~ Closed	9/26/16

COMMISSIONING/LEED ISSUES RESOLUTION LOG

Project: U.S. Diplomacy Center # 120103 **Date Last Revised: 4/25/2018**

Issue #	Issue	Date Found	Recommendations	Designer Direction	CM Comments	GC Actions Taken	Cx Comments	Date Resolved
7	Depression and honeycomb of concrete wall requiring patching prior to installation of Bituthane membrane	8/12/15	Provide smooth surface prior to installation of Bituthane membrane using mortar or grout patch troweled smooth		Heery monitored surface prep prior to application of the waterproofing membrane and observed concrete patched prior to installation of the waterproofing membrane.	Concrete profile has been prepared smooth and patched in accordance with manufacturer requirements.	~~As not all corrections have been complete issue will remain open~~ Closed	9/26/16
8	Isolated areas where primer is dusty and not suitable for installation of bituthane membrane.	8/12/15	Clean and reapply primer prior to installation of bituthane membrane.		Surface will be cleaned and primer will be reapplied in these areas once waterproofing contractor begins work on the 2nd lift. 8/1/16 – These areas were cleaned and primer was reinstalled prior to install and verified by Heery.	These locations were re-cleaned, primed and inspected by Heery	~~As not all corrections have been complete issue will remain open~~ Closed	9/26/16
9	Sealant primer being applied along grid line PC of mechanical room B101 not extending width of sealant being applied.	8/28/15	Contractor to apply primer slightly beyond full with of sealant being applied. Installation foreman increase diligence in installing waterproofing materials per manufacturer instructions.		Heery to continue monitoring installation of work and ensuring primer is applied full width of sealant.	Subcontractor increased quality inspections and no further observations have been noted.	Closed	9/29/15
10	Previous Issue #7 not addressed during construction. Recessed area in concrete requires filling to provide smooth surface to prevent voids that hinder good adhesion as shown in temporary application of Bituthene.	8/28/15	Prior to next application of sheet waterproofing troweling smooth depressions and protrusions per manufacture installation instructions		Prior to the next lift of waterproofing membrane application the concrete patching will occur for that area as per the approved patching plan. 8/1/16 - Heery monitored surface prep prior to application of the waterproofing membrane and observed concrete patched prior to installation of the waterproofing membrane.	Concrete profile has been prepared smooth in accordance with manufacturer requirements.	~~As not all corrections have been complete issue will remain open~~ Closed	9/26/16

COMMISSIONING/LEED ISSUES RESOLUTION LOG

Project: U.S. Diplomacy Center # 120103 **Date Last Revised: 4/25/2018**

Issue #	Issue	Date Found	Recommendations	Designer Direction	CM Comments	GC Actions Taken	Cx Comments	Date Resolved
11	Numerous areas were observed in the basement floor not ready for lapping of Preprufe waterproofing membrane.	8/28/15	Ensure the underside of the succeeding sheet is clean, dry and free from contamination before attempting to overlap. See manufacture's installation instructions.		Prior to completion of this waterproofing patch, the area was cleaned out of loose debris, preprufe patched and cleaned and penetration details were installed (as applicable).	Subcontractor increased quality inspections and no further observations have been noted.	Closed	9/29/15
12	Several areas with gaps larger sheet water proofing can span still require to be filled in.	9/25/15	Prior to reapplication of waterproofing primer on concrete substrate the substrate must be free from spalled areas, loose aggregate, sharp protrusions or other matter that will hinder the adhesion or regularity of the membrane installation. The surface should also be free from frost, dirt, grease, oil or other contaminants as outlined in the manufactures installation instructions.		Heery witnessed filling of concrete foundation wall voids and patching prior to installation of the foundation wall waterproofing.	Raker patches will filled and sharp edges were removed prior to the installation of the Bituthene membrane on the foundation wall	Closed	9/26/16
13	Typical condition to Issue #12 instructions. Patch rough wall areas with mortar, grout or approved sealant. Remove fins and form match lines.	9/25/15	See Issue # 12 recommendation		Heery monitored surface prep prior to application of the waterproofing membrane and observed concrete patched prior to installation of the waterproofing membrane.	Concrete patching completed prior to waterproofing	Closed	9/26/16
14	Copper pipe should not be in direct contact with concrete.	9/25/15	Wrap pipe with polymer material inside wall assembly. To prevent early degradation of pipe.		A link seal was added between the copper pipe and the concrete to act as a bond breaker. This penetration was also tested as part of the waterproofing penetrations test verified by Heery.	Bond breaker was provided around copper	Closed	9/26/16

COMMISSIONING/LEED ISSUES RESOLUTION LOG

Project: U.S. Diplomacy Center # 120103 **Date Last Revised: 4/25/2018**

Issue #	Issue	Date Found	Recommendations	Designer Direction	CM Comments	GC Actions Taken	Cx Comments	Date Resolved
15	Damaged waterproofing requiring repair with a minimum 6" lap over existing membrane.	9/25/15	Repair in accordance with Manufacturer's instructions		Heery witnessed filling of concrete foundation wall voids and patching prior to installation of the foundation wall waterproofing.	Raker patches will filled and sharp edges were removed prior to the installation of the Bituthene membrane on the foundation wall	Closed	9/26/16
16	Duct protective seal broken requiring repair in accordance with Construction IAQ requirements. Protection of electrical equipment from dirt and debris that can affect transformer's ability to cool properly.	9/25/15	Foreman to check at end of each day and have repaired as needed to maintain protection of dust and debris barrier.		Heery to witness duct cleaning and will verify startup of equipment during Cx	Ductwork to be cleaned prior to Cx phase and equipment to be tested.	Closed	9/26/16
17	Insufficient space to properly insulate ductwork and maintain insulation value and vapor barrier integrity.	9/25/15	Contractor to coordinate with insulation to ensure insulation is not compressed reducing insulation value and there are no penetrations in insulation exterior vapor barrier.		Heery concurs that there are pinched insulation areas that were identified as category II clashes during MEP coordination. These were confirmed and verified during wall/ceiling close in inspections.	Category II BIM clashes (design issues) were noted during design coordination where there may be pinched insulation, etc. DoS, GSA, BBB and Heery walked these areas and agreed upon acceptability	Closed	9/26/16
18	Insufficient space to allow insulation installation in main mechanical room. Insulation cannot be installed over duct hangers and spacers are required between duct and hanger to prevent compromising insulation value and damage to vapor barrier	9/25/15	See recommendation Issue #17		Heery concurs that there are pinched insulation areas that were identified as category II clashes during MEP coordination. These will be confirmed and verified during ceiling close in inspection.	Category II BIM clashes (design issues) were noted during design coordination where there may be pinched insulation, etc. DoS, GSA, BBB and Heery walked these areas and agreed upon acceptability	Closed	9/26/16

COMMISSIONING/LEED ISSUES RESOLUTION LOG

Project: U.S. Diplomacy Center # 120103 **Date Last Revised: 4/25/2018**

Issue #	Issue	Date Found	Recommendations	Designer Direction	CM Comments	GC Actions Taken	Cx Comments	Date Resolved
19	Contractor does not appear to be utilizing commissioning checklist as work progresses as required by specification.	9/25/15	Utilize commissioning checklists provided in specification and update weekly as required by specification. Make checklist available for CM and CxA review upon request.		Heery continues to remind Gilbane that these checklists are not being provided as required per specification and includes this item on the critical items list as provided in the GSA biweekly update briefing. Heery will submit to CxGBS as provided by Gilbane.	GBCo will comply	See Issue #20 Closed	9/27/16
20	Work required to have a completed Commissioning Checklist filled out and signed by contractor personal having direct knowledge of the work completed (trade foreman) as required by specification have not been received for work that has been completed as of 25 Sept. 15.	9/25/15	Provide executed commissioning checklists as required by specification to CxA as work is completed and schedule through GC Commissioning acceptance testing.		Heery continues to remind Gilbane that these checklists are not being provided as required per specification and includes this item on the critical items list as provided in the GSA biweekly update briefing. Heery will submit to CxGBS as provided by Gilbane.	GBCo will comply	CxGBS has started to receive checklists and will begin review. Issue will remain open as a reminder to the project team the importance of receiving construction checklists from the construction team. Closed	10/15/15 9/27/16
21	GC has not included commissioning activities in their project schedule or in their two week look ahead. Cx is a team sport and requires scheduling and project team cooperation.	9/25/15	Work with CxA to schedule Cx activities. Completion of Commissioning Checklists for waterproofing of waterproofing penetrations and scheduling testing of utility penetrations through subterranean wall assemblies. Provide schedule for completion of commissioning checklists and time period for Cx tests of utility penetrations through subterranean wall assemblies in next two week look ahead.		Heery continues to request a Cx schedule for remaining activities	GBCo will comply	See Issue #20 Closed	9/27/16

COMMISSIONING/LEED ISSUES RESOLUTION LOG

Project: U.S. Diplomacy Center # 120103 **Date Last Revised: 4/25/2018**

Issue #	Issue	Date Found	Recommendations	Designer Direction	CM Comments	GC Actions Taken	Cx Comments	Date Resolved
22	Additional sections of ductwork were observed during the site visit as not being protected as required by specification.	10/14/15	See Issue #16		Heery to confirm all duct cleaning is performed at end of project.	Duct work was protected and set into place. All duct work will be cleaned at end of project.	Closed	9/26/16
23	Waterproofing at intersection of USDC north below grade wall and Harry S. Truman east wall not correctly terminated in accordance with waterproofing manufacture installation procedures.	10/14/15	Recommend installing termination bar and Bituthene mastic or liquid membrane to secure and seal vertical edge of Bituthene sheet.		Work was completed and inspected by Heery prior to backfill.	Termination bar was installed and Bituthene tied in to existing HST foundation wall.	Closed	9/26/16
24	Water observed in interior below north skylight parapet wall.	3/9/16 & 3/10/16	Eliminate breach or discontinuity in the waterproofing membrane that transitions from the gypsum substrate to the gutter.		Retest occurred and area passed	Joint wasn't sealed when tested. This was retested and passed.	Closed	9/26/16
25	Water intrusion observed below skylight southeast corner.	3/9/16 & 3/10/16	Further investigation by FN is required to determine the exact path of water intrusion.		Awaiting proposed testing date from Gilbane	Work has been repaired and is ready for retest.	Closed	9/26/16
26	As designed and installed there does not appear to be a way the assembly can either insulated or isolated to adequately prevent or control condensation from forming on the assemblies exterior and water dripping from the assembly to the ceiling below.	3/9/16 & 3/10/16	Recommend issue be resolved prior to installing interior ceilings.		Heery observed spray insulation around low roof drains and sent photos to CxGBS prior to ceiling close in.	Drains were insulated with spray insulation	Closed	9/26/16
27	Multiple breaches observed in waterproofing along South Foundation requiring correction.	3/9/16 & 3/10/16	Correct breaches.		Waterproofing overlap was properly resealed and inspected by Heery.	Gaps were resealed in this area	Closed	9/26/16

COMMISSIONING/LEED ISSUES RESOLUTION LOG

Project: U.S. Diplomacy Center # 120103 **Date Last Revised: 4/25/2018**

Issue #	Issue	Date Found	Recommendations	Designer Direction	CM Comments	GC Actions Taken	Cx Comments	Date Resolved
28	There is a breach in the air/water/thermal barriers between insulated Curtain Wall and the foundation of the US Diplomacy Center. Design documents does not indicate that the foundation edge above grade will be insulated which will result in condensation during winter months to form within the interior wall assembly. In addition stainless steel support for the curtain wall is a thermal bridge through the assembly to the building interior.	3/9/16 & 3/10/16	Recommend adding insulation and sealing the area between the curtain wall and foundation.		I believe this issue has been resolved with the completion of work.	Work was not complete yet when this issue was identified. 123 tape is sealed against waterproofing and rigid insulation against exterior (underneath of lower curtainwall base)	Closed based on Heery observations.	9/28/16
29	Continuous vapor barrier not provided through wall opening.	3/9/16 & 3/10/16	Provide continuous insulation and vapor barrier surrounding all duct sections and through all wall penetrations.		This was completed and verified by Heery in above ceiling inspection	Vapor barrier was installed around duct at wall penetration	Closed based on Heery observations.	9/28/16
30	Vapor barrier not properly sealed.	3/9/16 & 3/10/16	Completely seal vapor barrier per manufacturer's requirements throughout project. Issue must be corrected prior to closing ceilings.		This was completed and verified by Heery in above ceiling inspection	Vapor barrier punctures were patched and all areas noted sealed	Closed based on Heery observations.	9/28/16
31	Vapor barrier not properly sealed.	3/9/16 & 3/10/16	Completely seal vapor barrier per manufacturer's requirements throughout project. Issue must be corrected prior to closing ceilings.		This was completed and verified by Heery in above ceiling inspection	Vapor barrier punctures were patched/repaired and all areas noted sealed	Closed based on Heery observations.	9/28/16

COMMISSIONING/LEED ISSUES RESOLUTION LOG

Project: U.S. Diplomacy Center # 120103 **Date Last Revised: 4/25/2018**

Issue #	Issue	Date Found	Recommendations	Designer Direction	CM Comments	GC Actions Taken	Cx Comments	Date Resolved
32	Vapor barrier not properly sealed.	3/9/16 & 3/10/16	Completely seal vapor barrier per manufacturer's requirements throughout project. Issue must be corrected prior to closing ceilings.		Vapor barrier sealed and verified by Heery during ceiling close in	Vapor barrier has been sealed	Closed based on Heery observations.	9/28/16
33	Support structure penetrating vapor barrier, penetrations not properly sealed.	3/9/16 & 3/10/16	Properly seal all vapor barrier penetrations per manufacturer's requirements throughout project. Issue must be corrected prior to closing ceilings.		Vapor barrier sealed and verified by Heery during ceiling close in	Vapor barrier/ structure has been properly sealed	Closed based on Heery observations.	9/28/16
34	Support structure penetrating vapor barrier, penetrations not properly sealed.	3/9/16 & 3/10/16	Properly seal all vapor barrier penetrations per manufacturer's requirements throughout project. Issue must be corrected prior to closing ceilings.		Vapor barrier sealed and verified by Heery during ceiling close in	Vapor barrier /structure has been properly sealed	Closed based on Heery observations.	9/28/16
35	Flex duct connection not properly sealed.	3/9/16 & 3/10/16	Properly seal all duct connections per manufacturer's requirements throughout project. Issue must be corrected prior to closing ceilings.		Sealed flex duct connections were observed by Heery at ceiling close-in inspection.	Flex duct connections were sealed prior to close in inspection	Closed based on Heery observations.	9/28/16

COMMISSIONING/LEED ISSUES RESOLUTION LOG

Project: U.S. Diplomacy Center # 120103 **Date Last Revised: 4/25/2018**

Issue #	Issue	Date Found	Recommendations	Designer Direction	CM Comments	GC Actions Taken	Cx Comments	Date Resolved
36	Evidence of a leak shown caused by roof leak from lower roof on north side of the facility, approximately 8 feet from west wall. Water was observed traveling along the metal deck ribs. Because the lower roof is not complete, the source of the leak could not be determined at time of site visit.	6/1/16 & 6/2/16	Contractor to determine source of leak and repair in order to eliminate all moisture intrusion.		Confirmed complete by Heery and addressed in Cx building enclosure water test.	Insulation was replaced and inspected during ceiling close in inspection. FNG completed work on north side of roof and was retested.	Closed based on Heery observations.	9/28/16
37	The western most lower roof drain on the south roof, outlined in Red below, failed allowing water to enter the building interior.	6/1/16 & 6/2/16	Contractor to determine source of failure and repair in order to eliminate all moisture intrusion		My understanding is that these drains passed cx testing.		While the drain passed there was water intrusion observed after testing of the drain. Source of water intrusion was not determined during site visit. Closed as no additional moisture intrusion reported.	9/30/16
38	Photographs show gaps that must be closed and areas in which additional insulation must be applied to seal against metal deck and adjacent enclose pipe hanger.	6/1/16 & 6/2/16	The clevis hanger body protruding beyond the insulation must be completely insulated.		Spray insulation was added and observed by Heery. Photographs were sent to CxGBS.	Spray insulation was added around the low roof drains and pipe hangers	Closed based on Heery observations.	9/28/16
39	Construction debris is being flushed into storm water system due to no strainers in place.	6/1/16 & 6/2/16	Suggest temporary ¼" hardware cloth cover over the drain opening in order to prevent large pieces of construction debris entering system.		Contractors removed visible debris from roof drains and permanent strainers were installed.	Strainers installed	Closed based on Heery observations.	9/28/16

COMMISSIONING/LEED ISSUES RESOLUTION LOG

Project: U.S. Diplomacy Center # 120103 **Date Last Revised: 4/25/2018**

Issue #	Issue	Date Found	Recommendations	Designer Direction	CM Comments	GC Actions Taken	Cx Comments	Date Resolved
40	Image shows damaged copper flashing on the Harry S. Truman building.	6/1/16 & 6/2/16	Repair copper flashing.		Copper flashing replacement is not within the scope of work, however since the EPDM roofing will be replaced with an IRMA roof after substantial completion with an IRMA roof, this will be addressed with the re-roof.	Not currently in scope	Closed	9/27/16
41	Cracks in the mortar joint shown at columns above the intersection with the USDC addition. These cracks are due to movement of the lower lime stone panel probably due to removal of lover stone section to accommodate tie in to new construction.	6/1/16 & 6/2/16	Remove and replace cracked mortar joints.		This will be reviewed during the exterior façade punchlist walk.		CxGBS request Heery confirm issue has been corrected. Closed	10/7/16
42	Vapor barrier discontinuities have been identified in a number of areas.	6/1/16 & 6/2/16	Seal vapor barrier at all penetrations, intersections, and terminations at assemblies.		Vapor barrier has been sealed at penetrations, intersections and assemblies noted in the photo report and confirmed by Heery.	Vapor barrier has been sealed at penetrations, intersections and assemblies noted in the photo report	Closed based on Heery observations.	9/28/16
43	A thermal bridge has been created by the duct support shown at left. The support is in contact with the duct within the insulation, exits the insulated assembly, and then is in contact with the steel structure above.	6/1/16 & 6/2/16	Relocate duct support to eliminate thermal bridge. Seal penetration where support exits vapor barrier.		Confirmed by Heery and EOR at final walk	Supports were insulated and rework completed.	Closed based on Heery observations.	9/28/16

COMMISSIONING/LEED ISSUES RESOLUTION LOG

Project: U.S. Diplomacy Center # 120103 **Date Last Revised: 4/25/2018**

Issue #	Issue	Date Found	Recommendations	Designer Direction	CM Comments	GC Actions Taken	Cx Comments	Date Resolved
44	A number of duct sections have not been installed fully extended and have an un-necessarily tight bend radius. This condition causes a need for increased fan power in order to supply airflow, increasing energy consumption by the HVAC system.	6/1/16 & 6/2/16	Install flex duct in accordance with ADC Flexible Duct Performance & Installation Standards and ASHRAE Handbook of Fundamentals 2013 to minimize pressure drop and flow restrictions.		Requesting additional code reference from CxGBS in support of this issue. If correct air values are achieved during air balancing this can be revisited.	They are installed per ADC Flexible Duct Performance & Installation Standards	Closed	9/27/16

COMMISSIONING/LEED ISSUES RESOLUTION LOG

Project: U.S. Diplomacy Center # 120103 **Date Last Revised: 4/25/2018**

Issue #	Issue	Date Found	Recommendations	Designer Direction	CM Comments	GC Actions Taken	Cx Comments	Date Resolved
45	Basement level restrooms and shower room have insufficient ventilation.	9/27/16	Investigate cause of no ventilation in restrooms and shower rooms and correct. Retesting is required once team believes issue has been resolved.				Our recommendation relative to the restroom exhaust will be as follows: 1. GC to ensure walls enclosing the restrooms and shower room are full height and continuous; all penetrations and joints are completely sealed including HVAC, plumbing, electrical and structural penetrations through the full height walls. 2. Mechanical contractor to ensure ducts installed per shop drawings are sealed in accordance with SMACNA Guideline 3, balancing dampers are installed as specified, and there are no obstructions in the ducts that would impede air flow of air through exhaust and transfer ducts. 3. TAB contractor to measure airflow at each supply and return opening within each room served by VVE-1.1 the traverse of main exhaust ducts serving basement restrooms and main floor above. Exhaust air path discovered to be blocked by structural element Corrections made by contractor and retested on 12/22/2016. Closed	12/22/16

COMMISSIONING/LEED ISSUES RESOLUTION LOG

Project: U.S. Diplomacy Center # 120103 **Date Last Revised: 4/25/2018**

Issue #	Issue	Date Found	Recommendations	Designer Direction	CM Comments	GC Actions Taken	Cx Comments	Date Resolved
46	Totals from airflow stations indicate a discrepancy of 6000CFM.	10/25/16	Recommend correcting disparity of 6000 CFM between ebtron flow stations. Recalibrate to eliminate disparity. Difference should not exceed 1600 cfm.				Closed	4/25/18
47	Operational issue reported by FMS. Indicating HVAC system not performing as needed. CxGBS Review: The return fans control correctly at sometimes, but not all times. The return fans are not controlling correctly at low airflows, and it appears that the issue could be related to the specific HVAC components occupancy schedules.	4/20/17	-Change the minimum outside air in occupied mode to approximately 5,000 as original established during commissioning. -Verify all of the building occupancy schedules for AHU, VAV boxes, and ERU are the same. -Check the operation of the VAV boxes to make sure that the damper position corresponds to the flow. For example, on 12/28/2017 VAV boxes 1.2 and 1.3 jumped from approximately 0 cfm to 480 cfm despite their dampers not moving. Additionally, box 1.2 damper stayed at 0 (assume 0 percent open) and box 1.3 stated at 100 (assume 100 percent open).					

COMMISSIONING/LEED ISSUES RESOLUTION LOG

Project: U.S. Diplomacy Center # 120103 **Date Last Revised: 4/25/2018**

Issue #	Issue	Date Found	Recommendations	Designer Direction	CM Comments	GC Actions Taken	Cx Comments	Date Resolved
48	Graphics not completed and control sequences do not conform to as-builts or contract documents.	11/22/17					Closed	4/25/18
49	Temperature sensor on VVD-2 is located upstream when it should be located downstream	11/22/17					Closed	4/25/18
50	Total CFM of the boxes does not match the total discharge CFM from the AHU	11/22/17					Difference is below 3500 CFM at max which is a difference of less than 10% and within acceptable tolerances. TAB was done at max flow and was verified for terminal boxes and AHU-1 output. Closed	
51	Exhaust damper VVDE 1-3 is creating noise	11/22/17						
52	It was brought to our attention in the meeting that during heavy or constant rains there is water infiltration in the mechanical room along the east wall. Inspection of this condition after the meeting reveals evidence of water ponding moisture along the wall. The contractor entered the access panel at the upper level and could not observe where the water had entered the building.	9/20/17					Further investigation required	

COMMISSIONING/LEED ISSUES RESOLUTION LOG

Project: U.S. Diplomacy Center # 120103 **Date Last Revised: 4/25/2018**

Issue #	Issue	Date Found	Recommendations	Designer Direction	CM Comments	GC Actions Taken	Cx Comments	Date Resolved
53	Issues reported in ground mounted exterior light fixtures	4/5/18					Electrical contractor is monitoring to resolve.	
54	A roof leaks occurred May 17th and August 8, 2017 which resulted from drains being clogged with debris and water backing up in gutters. It was determined that the roof in performing as designed and that this is a maintenance and operation issue. There has not been a reoccurrence since the gutters were cleared.	9/20/17					Maintenance is required as roof is not designed for continual ponding.	
55	Programming of the lighting system continues to be problematic for the building management. Training disc videos have not been distributed to the areas of concerns.	9/20/17					Contractor to provider searchable training videos per commissioning specifications	

Rushi Patel

From: HJ Enck
Sent: Wednesday, April 25, 2018 6:27 PM
To: Rushi Patel
Subject: FW: FW: Requested trend information

Use this response to the issues log and include in Cx report.

Thanks

H. Jay Enck, CxAP, HBDP, BEAP, LEED

CTO, Principal
hjenck@cxgbs.com
O: 770.831.6760 | F: 770. 831.6761 | M: 770.335.5717

From: HJ Enck
Sent: Wednesday, February 14, 2018 5:43 PM
To: 'Stewart, Allen R' <StewartAR@state.gov>; Varghese, Bennett <VargheseB@state.gov>; ronald.lucas@gsa.gov
Cc: baguayo@emcor.net; Michael Branson/EGS/EMCORGROUP (mbranson@emcor.net) <mbranson@emcor.net>; Rence Gill <rgill@bbbarch.com>; Patrick Murphy <PMurphy@vanderweil.com>; Garner, Michael A. <MGarner@GilbaneCo.com>; Swartzwelder, Tyler <TSwartzwelder@gilbaneco.com>
Subject: RE: FW: Requested trend information

All,

One of the primary goals of the analysis was to determine if the ERU, RA Fans and AHU were following the sequence of operation under actual operating conditions to see if there were conditions when the AHU inlet pressure could cause AHU SA fan motor to exceed the fan motors safety factor. What we were able to tell from the data:

1. Simple answer based on data contained in the trends received: The return fans control correctly at some times, but not all times. The return fans are not controlling correctly at low airflows, and it appears that the issue could be related to the specific HVAC components occupancy schedules. Some information:

a. The space CO_2 concentrations were typically in the 450 to 485 PPM range. The CO_2 concentration in the occupied space never exceeded 700 PPM which is below the set point requiring additional outside air volume. The ERU outside air damper is locked at a fixed position of 55% open during occupied times, and the OA flow value as measured by the OA AFMS varies slightly based on what the supply and return fans are doing. The return damper stays 100% open. The system is not controlling to an OA CFM setpoint resulting in over ventilation of the space and the associated energy penalty associated with over ventilation. Based on previous knowledge we remember that the change to the ERV operation was implemented by the contractor as a remedy to resolving the high AMP draw on AHU-1 supply fan motor. However, the owner could save a lot of money by lowering the minimum OA CFM to approximately 5,000 cfm (VFD at 20%), and still keep the building positively pressurized.

b. There are several periods of time, particularly at low supply airflow where (SA.FLOW)-(RA.FLOW) gives a negative number (which should never be the case). The graph below shows when the calculated OA number is going below zero. There is something happening within the controls causing SA airflow to jump from around 2k CFM to 15-20k CFM, and then back down again, and the RA flow is not responding accordingly. The SA 2k CFM is significantly below the OA 13k CFM supplied by ERU-1. There doesn't appear to be a pattern to when the SA jumps based on time of day trend data. There is a prolonged period of time where (SA.FLOW)-(RA.FLOW) are negative which were recorded between 8:30 on 01/05/2018 (Friday) and 11:30 on 01/08/2018 (Monday) - mostly over a weekend. These jumps happen at:
    i. 01/02/2018 at 10:30
    ii. 01/03/2018 at 14:00
    iii. 01/08/2018 at 11:45
    iv. 01/09/2018 at 13:15
    v. 01/10/2018 at 17:00

2. The OA value associated with the ERV closely matches the OA Flow at the AHU.

Additionally: The return air static osculates between negative and positive with a minimum of -0.06 and a maximum of +1.31 . If the return air static pressure sensor is located as I have clouded below, and the backdraft dampers are installed on each return fan, there shouldn't be a reason why the return static pressure became positive. There are also some issues with the VAV boxes in that the damper positions are not corresponding to the airflow coming out of them. The VAV dampers appear to stay in a fixed position and not responding to changes in SA static pressure/volume.

Solution: Our recommendations are:

- Change the minimum outside air in occupied mode to approximately 5,000 as original established during commissioning.
- Verify all of the building occupancy schedules for AHU, VAV boxes, and ERU are the same.
- Check the operation of the VAV boxes to make sure that the damper position corresponds to the flow. For example, on 12/28/2017 VAV boxes 1.2 and 1.3 jumped from approximately 0 cfm to 480 cfm despite their dampers not moving. Additionally, box 1.2 damper stayed at 0 (assume 0 percent open) and box 1.3 stated at 100 (assume 100 percent open).

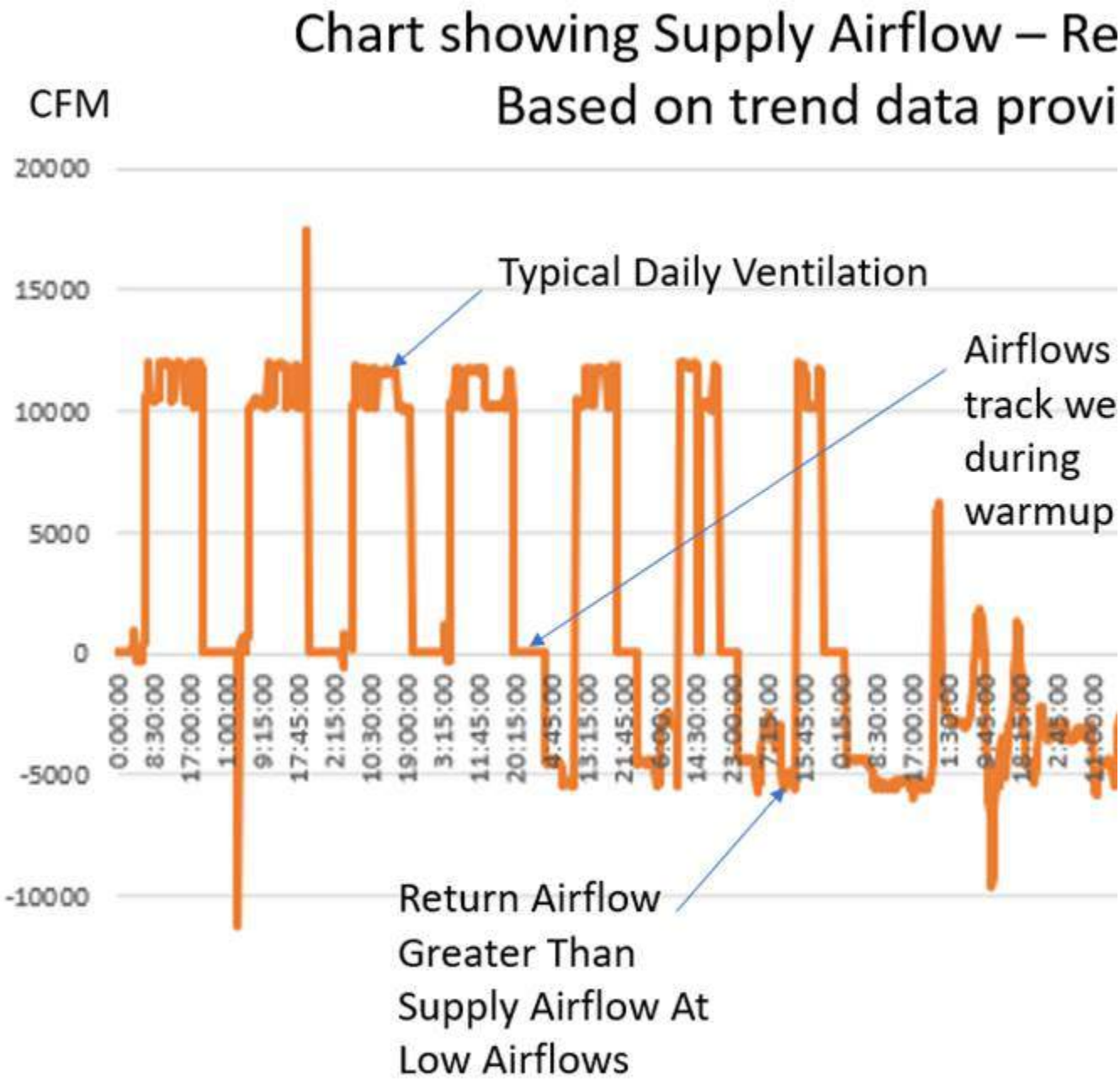
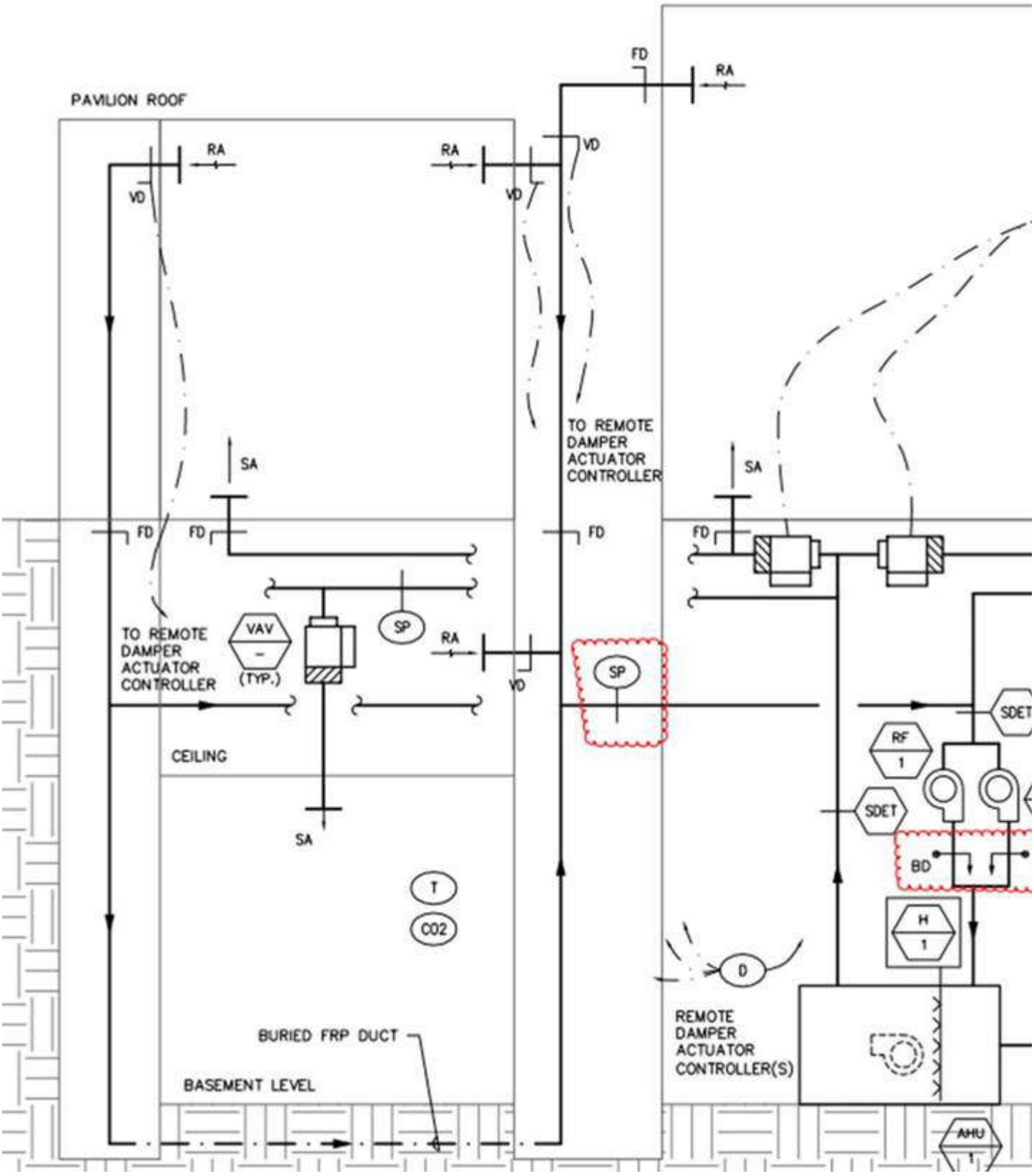


Chart showing Supply Airflow – Re
Based on trend data provi
CFM
20000
15000
10000
5000
0
-5000
-10000
Typical Daily Ventilation
Airflows track we during warmup
Return Airflow Greater Than Supply Airflow At Low Airflows


PAVILION ROOF
RA
VD
FD
SA
TO REMOTE DAMPER ACTUATOR CONTROLLER
VAV
(TYP.)
SP
CEILING
T
CO2
BURIED FRP DUCT
BASEMENT LEVEL
RF
1
SDET
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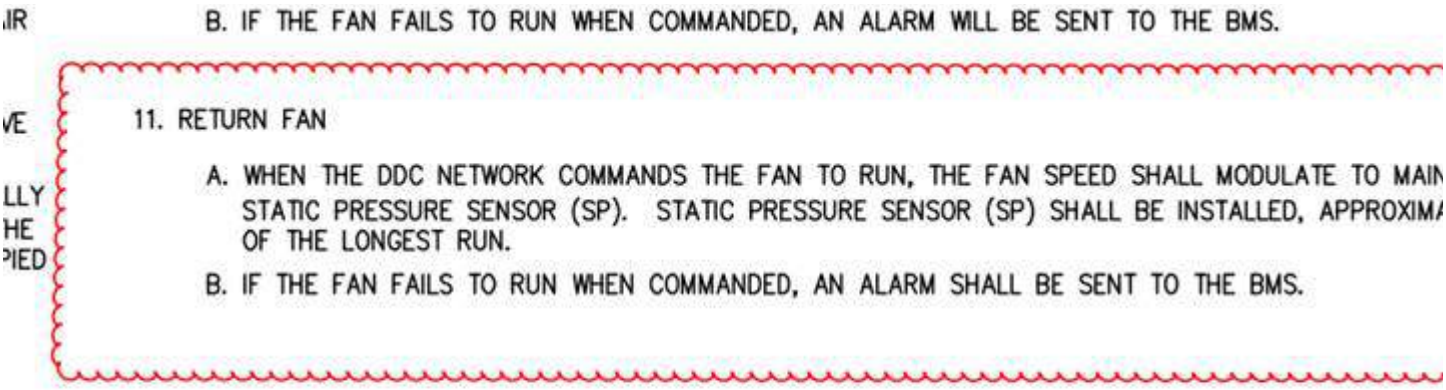
REMOTE DAMPER ACTUATOR CONTROLLER(S)
AHU



The return fan goes through a morning warm up mode from 3:30-6:30 where it operates at a relatively high speed. After the outside air is introduced at 6:30, it reduces speed in most cases. In summary the issues all appear to be HVAC controls related.

If you have any questions or comments, please let me know. Thanks.

H. Jay Enck, CxAP, HBDP, BEAP, LEED

CTO, Principal
hjenck@cxgbs.com
O: 770.831.6760 | F: 770. 831.6761 | M: 770.335.5717

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From: Stewart, Allen R [mailto:StewartAR@state.gov]
Sent: Monday, February 12, 2018 8:31 AM
To: HJ Enck <hjenck@cxgbs.com>; Varghese, Bennett <VargheseB@state.gov>; ronald.lucas@gsa.gov

Cc: baguayo@emcor.net; Michael Branson/EGS/EMCORGROUP (mbranson@emcor.net) <mbranson@emcor.net>
Subject: RE: FW: Requested trend information

Bennett,

What is the status concerning the trending information that was forwarded to the Cx Agent, Mr. Enck?

Thanks

Allen R. Stewart , RPA, FMA, SMA
COR, HST Building Mgr.
A/OPR/FMS, Rm. B2A61, Dept of State
2201 C Street NW, Wash., DC 20520
(202-647-9654) office
(202-528-9866) cell
Email; stewartar@state.gov

Official
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From: HJ Enck [mailto:hjenck@cxgbs.com]
Sent: Thursday, January 25, 2018 5:28 PM
To: Varghese, Bennett <VargheseB@state.gov>; ronald.lucas@gsa.gov; Stewart, Allen R <StewartAR@state.gov>; Rence Gill <rgill@bbbarch.com>; Patrick Murphy <PMurphy@vanderweil.com>; Garner, Michael A. <MGarner@GilbaneCo.com>
Cc: baguayo@emcor.net; David Cantrill <dcantrill@cxgbs.com>; John Rippel <JRippel@cxgbs.com>
Subject: RE: FW: Requested trend information

Bennett,

Sorry for the delayed response. Yes the information provided appears to match the information we requested. We will begin analysis and have answers to the outstanding questions we generated.

Thanks for your assistance.

H. Jay Enck, CxAP, HBDP, BEAP, LEED

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From: Varghese, Bennett [mailto:VargheseB@state.gov]
Sent: Thursday, January 11, 2018 9:02 AM
To: ronald.lucas@gsa.gov; HJ Enck <hjenck@cxgbs.com>; Stewart, Allen R <StewartAR@state.gov>; Rence Gill <rgill@bbbarch.com>; Patrick Murphy <PMurphy@vanderweil.com>; Garner, Michael A. <MGarner@GilbaneCo.com>
Cc: baguayo@emcor.net
Subject: FW: FW: Requested trend information

All,
Attached see requested trend data. Let us know if anything else is needed.
Bennett

From: Brian Aguayo [mailto:baguayo@emcor.net]
Sent: Thursday, January 11, 2018 8:51 AM
To: Stewart, Allen R <StewartAR@state.gov>
Cc: Bailey, James R <BaileyJR@state.gov>; John Gomez <jgomez@emcor.net>; Varghese, Bennett <VargheseB@state.gov>; Young, Kevin L <YoungKL@state.gov>; Timothy Grau <tgrau@emcor.net>
Subject: Re: FW: Requested trend information

Here is the requested 2 week trend data. Since we were discussing the exhaust yesterday, I also added a few additional points. If there are any points that Jay needs clarification on, please send them over. I have supplied the data in 2 different forms and separated the equipment (AHU01, ERU01 and all VAV's)

R/

Brian Aguayo, CPS
HVAC Lead
EMCOR Government Services
Department of State
2201 C Street, NW Suite B261E
Washington, DC 20520
Office: (202)747-6362
Cell: (410)320-4902

From: "Stewart, Allen R" <StewartAR@state.gov>
To: "baguayo@emcor.net" <baguayo@emcor.net>, John Gomez <jgomez@emcor.net>,
Cc: "Young, Kevin L" <YoungKL@state.gov>, "Bailey, James R" <BaileyJR@state.gov>, "Varghese, Bennett" <VargheseB@state.gov>
Date: 01/10/2018 03:50 PM
Subject: FW: Requested trend information

Brian, here is the specific information the commissioning agent is requesting,

Thanks,

Al

From: HJ Enck [mailto:hjenck@cxgbs.com]
Sent: Wednesday, January 10, 2018 3:33 PM
To: Stewart, Allen R; Young, Kevin L
Cc: ronald.lucas@gsa.gov; Varghese, Bennett; Rence Gill; Patrick Murphy
Subject: FW: Requested trend information

See requested information below previously requested. For efficiency I am only requesting the specific points, approximately 40 points, utilizing the point names contained in the contract documents. I do not wish to spend the time sorting through 200+ points to try and understand Siemens naming protocol to determine if the points provided match the requested information.

Could you send me the most recent trends with two weeks of data for the following BAS points?
RF-1 AFMS (CFMs)
RF-1 VFDS (HZ)
RF-1 VFDSO (HZ)
RF-2 AFMS (CFMs)
RF-2 VFDS (HZ)
RF-2 VFDSO (HZ)
RF SP (Inches of WC)
RF CO2 (PPM)
OAD Position serving AHU-1 (open %)
RAD Position serving AHU-1 (open %)
OAD Position serving ERU-1 (open %)
ERU-1 SF AFMS (CFMs)
ERU-1 SF VFDS (HZ)
ERU-1 SF VFDSO (HZ)
ERU-1 SP-1 (Inches of WC)
AHU-1 DAT (°F)
AHU-1 AFMS (CFMs)
All VFDs airflows (CFMs)

H. Jay Enck, CxAP, HBDP, BEAP, LEED

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From: HJ Enck
Sent: Monday, November 20, 2017 3:56 PM
To: 'StewartAR@State.gov' <StewartAR@State.gov>
Cc: 'Bennett Varghese' <vargheseb@state.gov>; ronald.lucas@gsa.gov
Subject: FW: Requested trend information

Mr. Steward,

Thank you for sending the trend data. We had request 40 specific points and received 229 points. After reviewing the 229 trends it appears that some of the trends are duplicates, same point names, and others named differently but similar in point type. We also could not find the VFD speed inputs and outputs which may be related to how the points were named. If EMCORE could provide just the requested points and their associated point name description that matches the design documents as outlined in our previous request this would be a great help. It would also be helpful if EMCORE could decode the naming structure used or what we often refer to as the secret decoder ring for the trend points provided in the attached trend data. We specifically do not understand the duplication of point names rows 38, 39. The differences between rows 25, 26 and 160, 161, and 163. We also could not find input and out motor speeds for return air fans or , ERU supply fan. We also did not see the ERU SP-1 or the return air static pressure trend or the RAD damper position serving the AHU. Would appreciate any help you can give regarding the point names and missing data so we can evaluate the data.

Is it possible to set up a conference call with FMS/EMCORE to clarify how the points contained in the trend log submitted relate to the BAS points contained in the design documents?

I have included the trends provided along with our original request to help facilitate resolution so that we can complete analysis of the return air fan function relative to design intent.

Hope you have a wonderful Thanksgiving.

H. Jay Enck, CxAP, HBDP, BEAP, LEED

CTO, Principal
hjenck@cxgbs.com
O: 770.831.6760 | F: 770. 831.6761 | M: 770.335.5717

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From: Bailey, James R [mailto:BaileyJR@state.gov]
Sent: Monday, November 20, 2017 11:43 AM
To: HJ Enck <hjenck@cxgbs.com>
Subject: RE: Requested trend information

Jay,

Forwarded on to Emcor so they can respond to your request.

Thanks

Jim

James R. Bailey, P.E.
Mechanical Engineer, Building Dynamics, LLC – Support Contractor
Department of State
Domestic Environmental and Safety Division
2201 C St., NW
A/OPR/FMS/DESD, Room B2A61
Washington, DC 20520
202-647-0838 (Office)
703-963-0824 (cell)
BaileyJR@state.gov

Official
UNCLASSIFIED

From: HJ Enck [mailto:hjenck@cxgbs.com]
Sent: Thursday, November 16, 2017 4:55 PM
To: Bailey, James R <BaileyJR@state.gov>
Cc: Stewart, Allen R <StewartAR@state.gov>; ronald.lucas@gsa.gov; Varghese, Bennett <VargheseB@state.gov>
Subject: Requested trend information

Jim,

Attached are the trends provided and our request for specific points. We are requesting the secret decoder ring for the trend points provided in the attached trend data. We do not understand the duplication of point names rows 38, 39. The differences between rows 25, 26 and 160, 161, and 163. We also could not find input and out motor speeds for return air fans or , ERU supply fan. We also did not see the ERU SP-1 or the return air static pressure trend or the RAD damper position serving the AHU. Would appreciate any help you can give regarding the point names and missing data so we can evaluate the data.

Regards

H. Jay Enck, CxAP, HBDP, BEAP, LEED

CTO, Principal
hjenck@cxgbs.com
O: 770.831.6760 | F: 770. 831.6761 | M: 770.335.5717

----- Message from HJ Enck <hjenck@cxgbs.com> on Thu, 16 Nov 2017 21:54:34 +0000 -----

To:	"Bailey, James R" <BaileyJR@state.gov>
cc:	"StewartAR@State.gov" <StewartAR@State.gov>, "ronald.lucas@gsa.gov" <ronald.lucas@gsa.gov>, 'Bennet <vargheseb@state.gov>
Subject:	Requested trend information

Jim,

Attached are the trends provided and our request for specific points. We are requesting the secret decoder ring for the trend points provided in the attached trend data. We do not understand the duplication of point names rows 38, 39. The differences between rows 25, 26 and 160, 161, and 163. We also could not find input and out motor speeds for return air fans or , ERU supply fan. We also did not see the ERU SP-1 or the return air static pressure trend or the RAD damper position serving the AHU. Would appreciate any help you can give regarding the point names and missing data so we can evaluate the data.

Regards

H. Jay Enck, CxAP, HBDP, BEAP, LEED

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hjenck@cxgbs.com
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----- Message from "Stewart, Allen R" <StewartAR@state.gov> on Tue, 14 Nov 2017 12:38:50 +0000 -----

To:	HJ Enck <hjenck@cxgbs.com>
cc:	"ronald.lucas@gsa.gov" <ronald.lucas@gsa.gov>, "Varghese, Bennett" <VargheseB@state.gov>, Rence Gill <PMurphy@vanderweil.com>
Subject:	RE: USDC Requested Trend Data

Jay,

Sorry, I thought I have forwarded that to you, attached, is what I got from EMCOR on our BAS for USDC.

Regards,

Allen R. Stewart , RPA, FMA, SMA
COR, HST Building Mgr.
A/OPR/FMS, Rm. B2A61, Dept of State
2201 C Street NW, Wash., DC 20520
(202-647-9654) office
(202-528-9866) cell
Email; stewartar@state.gov

From: HJ Enck [mailto:hjenck@cxgbs.com]
Sent: Monday, November 13, 2017 7:19 PM
To: Stewart, Allen R
Cc: ronald.lucas@gsa.gov; Varghese, Bennett; Rence Gill; Patrick Murphy
Subject: USDC Requested Trend Data

Mr. Stewart,

I have not received the requested trends. Can you provide an update on when we might receive them? I have include the original request for your convenience.

H. Jay Enck, CxAP, HBDP, BEAP, LEED

CTO, Principal
hjenck@cxgbs.com
O: 770.831.6760 | F: 770. 831.6761 | M: 770.335.5717

CxGBS
Commissioning & Green Building Solutions, Inc.
BUILDING PERFORMANCE RIGHT FROM THE START

management.

[attachment "HST DIPL TREND.CSV" deleted by Brian Aguayo/EGS/EMCORGROUP]

----- Message from HJ Enck <hjenck@cxgbs.com> on Tue, 14 Nov 2017 00:19:06 +0000 -----

To:	"StewartAR@State.gov" <StewartAR@State.gov>
cc:	"ronald.lucas@gsa.gov" <ronald.lucas@gsa.gov>, "'Bennett Varghese (vargheseb@state.gov)'" <vargheseb@s <PMurphy@vanderweil.com>
Subject:	USDC Requested Trend Data

Mr. Stewart,

I have not received the requested trends. Can you provide an update on when we might receive them? I have include the original request for your convenience.

H. Jay Enck, CxAP, HBDP, BEAP, LEED

CTO, Principal
hjenck@cxgbs.com
O: 770.831.6760 | F: 770. 831.6761 | M: 770.335.5717

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----- Message from HJ Enck <hjenck@cxgbs.com> on Mon, 30 Oct 2017 15:44:38 +0000 -----

To:	"StewartAR@State.gov" <StewartAR@State.gov>
cc:	"ronald.lucas@gsa.gov" <ronald.lucas@gsa.gov>, "'Bennett Varghese (vargheseb@state.gov)'" <vargheseb@s <PMurphy@vanderweil.com>
Subject:	Request for data from USDC BAS system.

Mr. Stewart,

It is my understanding that the USDC systems are being trended continuously. We are working to determine if the RA fans are

performing as intended and did not find the air flow data in the previous trends provided. Could you send me the most recent trends with two weeks of data for the following BAS points?
RF-1 AFMS (CFMs)
RF-1 VFDS (HZ)
RF-1 VFDSO (HZ)
RF-2 AFMS (CFMs)
RF-2 VFDS (HZ)
RF-2 VFDSO (HZ)
RF SP (Inches of WC)
RF CO_2 (PPM)
OAD Position serving AHU-1 (open %)
RAD Position serving AHU-1 (open %)
ERU SF AFMS (CFMs)
ERU SF VFDS (HZ)
ERU SF VFDSO (HZ)
ERU SP-1 (Inches of WC)
AHU-1 DAT (°F)
AHU-1 AFMS (CFMs)
All VFDs airflows (CFMs)

Thank You for your assistance.

H. Jay Enck, CxAP, HBDP, BEAP, LEED

CTO, Principal
hjenck@cxgbs.com
O: 770.831.6760 | F: 770. 831.6761 | M: 770.335.5717

[attachment "image002.jpg" deleted by Brian Aguayo/EGS/EMCORGROUP] [attachment "image004.jpg" deleted by Brian Aguayo/EGS/EMCORGROUP] [attachment "image006.png" deleted by Brian Aguayo/EGS/EMCORGROUP] [attachment "image008.png" deleted by Brian Aguayo/EGS/EMCORGROUP] [attachment "image010.png" deleted by Brian Aguayo/EGS/EMCORGROUP]

Rushi Patel

From: HJ Enck
Sent: Wednesday, April 25, 2018 6:22 PM
To: Rushi Patel
Subject: FW: USDC Warranty Meeting - Gilbane Comments
Attachments: 0001 Briggs Email 10-5-17 154pm.pdf; 0002 JER Light Leak Report - Email 10-6-17.pdf; 0002 JER Light Leak Report - Email 10-12-17.pdf; 0002 JER Light Leak Report Electrical Drawings EL1.03.pdf; Warranty Insptn Mtg Record _ October 23 2017 Gilbane Comments.docx

FYI

H. Jay Enck, CxAP, HBDP, BEAP, LEED

CTO, Principal
hjenck@cxgbs.com
O: 770.831.6760 | F: 770. 831.6761 | M: 770.335.5717

From: Ronald Lucas - WPIA <ronald.lucas@gsa.gov>
Sent: Tuesday, October 31, 2017 3:28 PM
To: HJ Enck <hjenck@cxgbs.com>; Patrick Murphy <PMurphy@vanderweil.com>; Rence Gill <RGill@bbbarch.com>
Cc: Bennett Varghese <vargheseb@state.gov>; Robert Sanders <SANDERSRH@state.gov>; Stewart, Allen R <stewartar@state.gov>
Subject: Fwd: USDC Warranty Meeting - Gilbane Comments

Patrick and Jay,

Please especially note the WE Bowers comments in response to Mr. Bailey's (FMS) concerns (attachment no 1).

Thanks,

Ronald
---------- Forwarded message ----------
From: **Garner, Michael A.** <MGarner@gilbaneco.com>

Date: Tue, Oct 24, 2017 at 3:58 PM
Subject: RE: USDC Warranty Meeting - Gilbane Comments
To: Ronald Lucas - WPIA <ronald.lucas@gsa.gov>
Cc: "Swartzwelder, Tyler" <TSwartzwelder@gilbaneco.com>

Ronald –

Please see attached comment status from Gilbane, and supplemental attachments.

Would like to discuss before the end of this week.

Thank you,

Michael Garner | Senior Quality Control Manager | Gilbane Building Company

1100 N. Glebe Road | Suite 1000 | Arlington, VA | 22201

O: (703) 312-7240 | M: (240) 417-4623

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Gilbane, a three-time member of Fortune's "100 Best Places to Work" list and a thirteen-time member of *Training Magazine's* Top 125

From: Ronald Lucas - WPIA [mailto:ronald.lucas@gsa.gov]
Sent: Monday, October 09, 2017 7:36 PM
To: Garner, Michael A.
Subject: USDC Warranty Meeting - Word Copy

Michael,

I appreciate your efforts. Let's stay in touch.

Thanks,

Ronald

--

Ronald Lucas

GSA Project Manager

Office of Project Delivery

301 7th Street, SW, Room 7415

Washington, DC 20407

Tele: (202) 401-0183

Cell: (202) 365-3106

ronald.lucas@gsa.gov

--
Ronald Lucas
GSA Project Manager
Office of Project Delivery
301 7th Street, SW, Room 7415
Washington, DC 20407
Tele: (202) 401-0183
Cell: (202) 365-3106
ronald.lucas@gsa.gov

Garner, Michael A.

From: Mark Briggs <mbriggs@webowers.com>
Sent: Thursday, October 05, 2017 1:54 PM
To: Garner, Michael A.; Swartzwelder, Tyler
Cc: Mike Martin; Tom Mannas; 'Lubawski, Tom'; Steve Goode; Jim Kelleher; Bennof, Jake; 'Jeffrey Scott Lavell'; James L Railey Jr.
Subject: RE: US Diplomacy Center
Attachments: JCI US Diplomacy AHU-1 Service Report 8-17-2017.pdf; Metro TAB US Diplomacy 9-19-17 300286.pdf

Michael and Tyler

We acknowledge receipt of the email from Tom Bailey dated 7-26-2017 advising of Mechanical System Concerns down at the US Diplomacy Center.

We forwarded subject concerns to our Team and have received responses from same.

Please see the emails below from Siemens, Tom Lubawski dated 9-27-2017 below and their response to Tom Bailey's comments in Red Text.

Bowers has reviewed the findings below and forwarded the Siemens comments to Metro Test and Balance and Johnson Controls and we concur with Siemens that observations made via the graphics do not provide a real time picture of overall system operation.

The purpose of our visit on 9-17-2017 was to respond to an open warranty issue relating to a perceived problem with Air Handling Unit Motor which tripped the Variable Frequency Drive on over current on more than one occasion. We had representatives of Johnson Controls (Air Handling Unit and VFD, Supplier / Manufacturer), Bowers Mechanical Contractor, Siemens (ATC Contractor) and Metro Test and Balance to verify and resolve the perceived problem. As a follow-up to the meeting we submitted documents from Johnson Controls confirming the actions they performed to verify that the Air Handling Unit Motor and the Variable Frequency Drive where functioning correctly. We received and submitted a report from Metro Test and Balance dated 9-19-2017. This report included revised TAB Data Sheets for the AHU-1 and VAV's served by same.

The Bowers Team commissioned this project in the late summer early fall of 2016 and turned operation of the system over the Building to the Owner. Our team has responded to numerous issues on this project and have found on more than one occasion that the Owner and Building Operator's are operating this building outside of the system design parameters which have been a factor in some of these problems.

We believe that our latest work effort satisfies all of Bowers and its Subcontractor's Contract obligations for this project. We do not intend on providing any additional mechanical services under this Contract. We consider this project closed.

We request that Gilbane confirm that we may consider this project closed.

Thanks

Mark Briggs
Vice President Government Sector
W.E. Bowers & Associates Inc.

12401 Kiln Court
Beltsville Md. 20705

P 301-837-2384 Main Office
F 301-419-2711 Main Office
C 301-440-3982

From: Lubawski, Tom [mailto:tom.lubawski@siemens.com]
Sent: Wednesday, September 27, 2017 2:29 PM
To: Lubawski, Tom; Mark Briggs; Steve Goode; Jim Kelleher; Bennof, Jake; 'Jeffrey Scott Lavell'; James L Railey Jr.
Cc: Mike Martin; Tom Mannas
Subject: RE: US Diplomacy Center

Mark,

I happened to have a technician on site today and just called him to check the below referenced VAVs. All four of these VAVs are controlled as a part of the Pavillion North West zone. There is a specific temperature setpoint (MS.DIPL.PAVILION.NW.TEMP) on the graphics which is currently overridden to 70 Deg F for that zone. These type of operational concerns are usually addressed between EMCOR and FMS. If EMCOR does not know how to fix such an issue they will reach out to Siemens during our preventative maintenance visits and we will work with them to figure it out. We have left the setpoint in override in case EMCOR or FMS has a specific reason for this setpoint.

V/R
Tom Lubawski
Service Operations Supervisor

Siemens Industry, Inc.
6435 Virginia Manor Road
Beltsville, MD 20705, USA
Cell: +1 (301) 440-6225
Fax: +1 (301) 206-2141
tom.lubawski@siemens.com

From: Lubawski, Tom (RC-US BT FLD Z5 DC SVC BAU-1)
Sent: Wednesday, September 27, 2017 2:10 PM
To: 'Mark Briggs'; Steve Goode; Jim Kelleher; Bennof, Jake (RC-US BT FLD Z5 DC SVC BAU-1); 'Jeffrey Scott Lavell'; James L Railey Jr.
Cc: Mike Martin; Tom Mannas
Subject: RE: US Diplomacy Center

Mark,

Please see my comments in red below.

This is a commissioned system and all commissioning concerns should go through the commissioning team if the results were not accepted by the customer. If the commissioning results were accepted, then this is a customer request and all trades should be compensated accordingly. Please address this issue first. Second, why did none of these issues come out during commissioning and why were they not solved at that time? Siemens cannot warranty potential manipulation by the customer and any deviation from As-Built settings. If there is a specific concern with the Siemens equipment, we can respond on a warranty request, however our warranty does not cover setpoints and/or returning a project to its commissioned state months after the project was turned over to the customer. A lot of the requests below seem to involve Siemens demonstrating and educating the building owners on the system. This was handled during commissioning and training phase when most of the parties involved decided not to attend. Siemens will not repeat this process without a PO.

I will have a technician check the referenced VAVs below while they are on a PM for DOS and see if any of the setpoints have been overridden or if there are any glaring concerns.

V/R
Tom Lubawski
Service Operations Supervisor

Siemens Industry, Inc.
6435 Virginia Manor Road
Beltsville, MD 20705, USA
Cell: +1 (301) 440-6225
Fax: +1 (301) 206-2141
tom.lubawski@siemens.com

From: Mark Briggs [mailto:mbriggs@webowers.com]
Sent: Wednesday, September 27, 2017 10:51 AM
To: Steve Goode; Jim Kelleher; Bennof, Jake (RC-US BT FLD Z5 DC SVC BAU-1); Lubawski, Tom (RC-US BT FLD Z5 DC SVC BAU-1); 'Jeffrey Scott Lavell'; James L Railey Jr.
Cc: Mike Martin; Tom Mannas
Subject: FW: US Diplomacy Center

Steve, Jim, Jake, Tom, James and Jeffrey

Attached is an email from US Diplomacy wherein they advise of concerns with ATC Controls and Balancing.

This issues does not appear to be going away.

I am going to review this email in-house with Mike Martin and reach out to all of you on possible responses and actions to be taken.

Thanks

Mark Briggs
Vice President Government Sector
W.E. Bowers & Associates Inc.
12401 Kiln Court
Beltsville Md. 20705

P 301-837-2384 Main Office
F 301-419-2711 Main Office
C 301-440-3982

From: Swartzwelder, Tyler [mailto:TSwartzwelder@gilbaneco.com]
Sent: Wednesday, September 27, 2017 10:15 AM
To: Mark Briggs; Garner, Michael A.; Romrell, Kendall
Subject: FW: US Diplomacy Center

Mark/Garner,

See below.

From: Varghese, Bennett [mailto:VargheseB@state.gov]
Sent: Wednesday, September 27, 2017 8:31 AM
To: ronald.lucas@gsa.gov; Jones, Warren K.; HJ Enck; Swartzwelder, Tyler; Romrell, Kendall; Garner, Michael A.
Cc: Stewart, Allen R
Subject: FW: US Diplomacy Center

Ron,
See some follow-on mechanical issues as documented by FMS below that will still need to be addressed.
Regards,
Bennett

Official
UNCLASSIFIED

From: Bailey, James R
Sent: Tuesday, September 26, 2017 4:04 PM
To: Stewart, Allen R
Cc: Meetre, Frederick; Baker, David W; Bradish, Stephen R
Subject: US Diplomacy Center

Al,

Last week on September 19, 2017 Rick Meetre and Hon Chau worked with the TAB contractor and the commissioning agent to evaluate some of the issues related to the HVAC system in the new US Diplomacy Center. In addition Hon also did some followup work by reviewing information on the Building Automation System (BAS) on September 21, 2017. Progress has been made to resolve some of the issues we do not think that everything is completely resolved yet. Following is a summary of what we have found over the past week:

1) On Tuesday, September 19, 2017 the two largest VAV boxes (VVD2.1 & VVD2.2) serving the Diplomacy Center were found to have incorrect flow calibration factors. When the flow station manufacturer's flow factor was entered into the Siemens program, the result was that actual air flow was reduced by approximately half from what was previously shown on the BAS for the two boxes. This resulted in the total VAV CFM for all boxes being closer to the supply fan CFM reading but still differed by 2,754 CFM which is an 11% difference. One would expect these to be within 2% or better. – These controllers were balanced during the project. These are not balanced the same way as other VAVs, and the manufacturer's flow factor references a factory controller no longer used for these boxes. Simply setting values to the original manufacturer setpoint are not accurate for this configuration. The duct area and flow coeff points are both used as a K factor on the PTEC controller.
2) On Thursday, September 21, 2017 Hon Chau looked at the graphics on the BAS and found that the summation of the airflow of all the VAV boxes was different than the measurement of the AHU airflow sensor by approximately 6,000 CFM. – Please note that scrolling through graphics can leave a lag in time in which VAVs are modulating at different flows and does not give an instantaneous snapshot of the project. Siemens does agree that though this process is inaccurate, there is a differential observed. This is however something that cannot be solved by Siemens.
3) On Thursday, September 21, 2017 Hon Chau found that some of the boxes do not appear to be operating properly. He noted that boxes VAV2.8, VAV2.10, VVD2.1 and VVD2.2 were all operating at their maximum airflow (CFM). The highest temperature at the thermostat for VVD2.1 and VVD2.2 was 72 deg F. Other temperatures were lower. According to the Asbuilt control drawings, the cooling setpoint is 75 deg F. Therefore, VAV boxes should remain at minimum airflow until the cooling setpoint is exceeded. – This statement excludes many contributing factors. Asbuilt settings cannot be

a test bench if the boxes have been turned over to the client for many months. Please compare the CTL TEMP and CTL STPT points. Check if the VAV is in HEAT or COOL mode and the CLG or HTG LOOPOUT.

4) On Thursday, September 21, 2017, Hon noted that the maximum discharge air temperature for the AHU reached 60 deg F early in the morning. This is the first time that we have seen the discharge air temperature higher than 54 deg F indicating that the reset schedule appears to be working. – Noted.
5) On Tuesday, September 26, 2017 Jim Bailey noted that the discharge air temperature of AHU-1 was 57.33 deg F. - Noted
6) On Tuesday, September 26, 2077 Jim Bailey looked at the graphics on the BAS and found that the summation of all the VAV boxes was different than the measurement of the AHU airflow sensor by approximately 7,000 CFM. – See note above regarding graphical summation of VAV air flows.
7) On Tuesday, September 26, 2017 Jim Bailey found that VAV2.8, VAV2.10, VVD2.1, and VVD2.2 were operating at their maximum airflow although the temperature was 72.75 deg F. According to the Asbuilt control dawings, the cooling setpoint is 75 deg F. Therefore, VAV boxes should remain at minimum airflow until the cooling setpoint is exceeded. – See note above
8) On Tuesday September 26, 2017 the ERU was off on emergency alarm (relayed to EMCOR to investigate).

So there is improvement in operation of the system, but there are still some issues that need to be resolved and will require additional time onsite by the contractor. One concern was that there was no means available on September 19 to measure the airflow at the registers to actually calibrate air flow for the two boxes VVD2.1 & VVD2.2. It is recommended that the TAB contractor returns with a flow hood for the application and measure flow at the registers with the boxes set for maximum flow. The differential pressure at the box flow stations should also be read so the resulting CFM can be compared to the flow hood readings. These readings should match to prove air flow is not escaping by leaks into the ceiling space. The reason for this test is that flow hood readings taken with FMS flow measurement equipment on September 19 indicated much less air flow at the registers than at the VAV box, but these readings were unofficial. Therefore, the readings need to be done with certified equipment and personnel. If total VAV flow does not match AHU CFM after performing these additional tests, further flow hood readings of other boxes will be necessary to find and fix the cause of the discrepancy. On September 19 Rick and Hon could not proceed without assistance from a Siemens technician who was not available. Also the contractor did not bring any mechanical drawings for reference while work was being completed. On the next site visit, the contractor needs to provide mechanical drawings and the Siemens technician needs to be onsite for the duration as well to finish tasks required.

Let us know if you need any additional information from us.

Jim

James R. Bailey, P.E.
Mechanical Engineer, Building Dynamics, LLC – Support Contractor
Department of State
Domestic Environmental and Safety Division
2201 C St., NW
A/OPR/FMS/DESD, Room B2A61
Washington, DC 20520
202-647-0838 (Office)
703-963-0824 (cell)
BaileyJR@state.gov

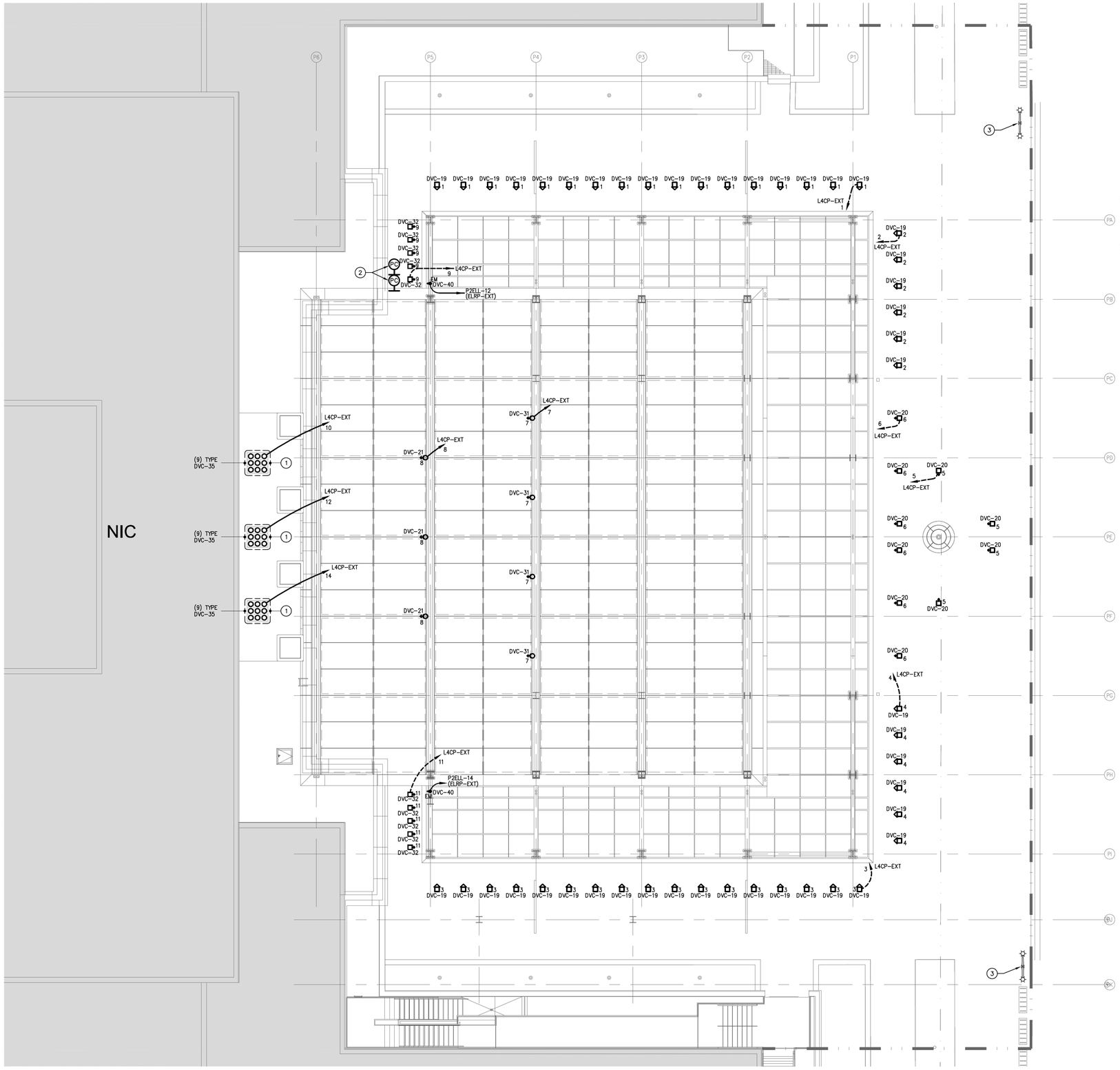
Garner, Michael A.

From: Brett Rhinevault (JE Richards) <brhinevault@phalconusa.com>
Sent: Friday, October 06, 2017 2:28 PM
To: Swartzwelder, Tyler; Garner, Michael A.; Romrell, Kendall
Cc: Juan Ruiz (JE Richards)
Subject: US Diplomacy Center Electrical Drawings EL1.03.pdf
Attachments: US Diplomacy Center Electrical Drawings EL1.03.pdf

Follow Up Flag: Follow up
Flag Status: Flagged

Gentlemen,
See attached drawing.
I met the manufacturers rep on site this morning to investigate the fixtures with condensation/water in the fixture and the attached drawing reflects what was found.
We know the building engineers have been opening these fixture to investigate the water, but they should not do so if they want the warranty to stay valid.
Looks like some were opened and adjusted to angle towards flag or building. Normally that would be fine if done on a dry day, if they use a #3 phillips bit, put the cover back on in the direction it was in previously, and tighten all 4 screws. What we found was damaged screw heads from using the wrong size Phillips bit, missing screw gaskets from removal and replacement without checking for screw gasket, dirty gaskets from removing cover and not properly cleaning before replacing, and loose cover screws that can allow water to enter the fixture. All of which can compromise the water tight seal at the top of the fixture.
The building maintenance crew needs to know how to properly open and close these fixtures if they are going to be opening them again for any reason.
Nick and I tightened all the cover screws before we left today.
I am not sure what the rep is going to report back to the manufacturer, but I will let you know the outcome. The manufacturer is actually going to be intown this weekend, so we invited him to walk buy when its dark and see how many are out and how many have condensation. We could not get in to turn on the circuit this morning, so I couldn't get an accurate count of how many were not functioning.
I will let you know what comes back from manufacturer.
Thanks,

Brett Rhinevault
Project Manager
J.E. Richards, Inc.
10401 Tucker Street.
Beltsville, MD. 20705
Office: 301-345-1300
Cell: 301-440-6250



GENERAL NOTES:

A. REFER TO ARCHITECTURAL REFLECTED CEILING PLANS FOR THE EXACT LOCATIONS OF LIGHTING FIXTURES.

B. REFER TO "LL SERIES" DRAWINGS FOR LIGHTING FIXTURE DETAILS.

C. REFER TO THE LIGHTING FIXTURE SCHEDULE WITHIN THE PROJECT MANUAL FOR THE MANUFACTURERS, CATALOG NUMBERS AND DESCRIPTIONS OF ALL LIGHTING FIXTURES.

D. REFER TO THE "CONTROL STRATEGY" SERIES "LL" DRAWINGS FOR THE LIGHTING CONTROL STRATEGY.

DRAWING NOTES:

1. REPLACE EXISTING LIGHTING AT ROOF PORTICO. CONTROL FROM EXTERIOR PHOTOCELL AND TIME CLOCK INTEGRAL TO RELAY PANEL.
2. PROVIDE EXTERIOR PHOTOCELL. MOUNT PHOTOCELL 12'-0" ABOVE FINISH GRADE. PHOTOCELL SHALL CONTROL EXTERIOR LIGHTING. PHOTOCELL ON / TIME CLOCK OFF OPERATION.
3. REMOVE, CLEAN AND STORE EXISTING EXTERIOR POLE MOUNTED LIGHT FIXTURE. RE-INSTALL AT SAME LOCATION DURING INSTALLATION OF INGROUND LIGHTING.

LIGHTING SYMBOLS

RDY-1	INDUSTRIAL SURFACE MOUNTED LIGHTING FIXTURE	DVC-24D	RECESSED WALL WASH DOWN LIGHT
RDY-2	INDUSTRIAL CHAIN SUSPENDED LIGHTING FIXTURE	DVC-26A	RECESSED DOWN LIGHT
RDY-3	ENCLOSED INDUSTRIAL LIGHTING FIXTURE	DVC-26B	RECESSED DOWN LIGHT
RDY-4	WALL MOUNTED LIGHTING FIXTURE	DVC-27	RECESSED WALL WASH DOWN LIGHT
RDY-5	24"X24" RECESSED LUMINAIRE	DVC-28	RECESSED DOWN LIGHT
RDY-6	LED "EXIT" SIGN ON LIFE SAFETY EMERGENCY SOURCE	DVC-29	RECESSED DOWN LIGHT
RDY-10	LED "EXIT" SIGN ON LIFE SAFETY EMERGENCY SOURCE	DVC-30A	BUS RUN MTD LED LIGHT
DVC-14	BUS RUN MOUNTED WALL WASH FIXTURE	DVC-30B	BUS RUN MTD HALOGEN LIGHT
DVC-16	LINEAR COVE LIGHT	DVC-31	EXTERIOR SURFACE MTD. SPOTLIGHT
DVC-17	24"X24" RECESSED LUMINAIRE	DVC-32	RECESSED INGRADE UPLIGHT
DVC-19	RECESSED INGRADE UPLIGHT	DVC-34	RECESSED DOWN LIGHT
DVC-20	RECESSED INGRADE UPLIGHT	DVC-35	RECESSED FLOOD LIGHT
DVC-21	EXTERIOR SURFACE MTD. UPLIGHT	DVC-36	RECESSED DOWN LIGHT
DVC-22	RECESSED DOWN LIGHT	DVC-38	LINEAR LIGHT
DVC-23	RECESSED WALL WASH DOWN LIGHT	DVC-39	RECESSED DOWN LIGHT
DVC-24A	RECESSED DOWN LIGHT	DVC-40	EXTERIOR SURFACE MTD. LIGHT
DVC-24B	RECESSED DOWN LIGHT	DVC-41	RECESSED DOWN LIGHT
DVC-24C	RECESSED WALL WASH DOWN LIGHT		

EGRESS LIGHTING NOTE:

LIGHTING FIXTURES WITH SUBSCRIPT "EM" OR DARK SHADING ON THE EL SERIES DRAWINGS INDICATES THAT FIXTURE SHALL BE POWERED FROM A LIFE SAFETY EMERGENCY SOURCE.

1 EL1.03 ENTRY PAVILION ROOF AND SITE LIGHTING PLAN
Scale: 1/8"=1'-0"

N

0 2' 4' 8' 16'

Monday, January 07, 2013 CHARLES, BRIAN
N:\VH106.00\ELEC\VH106EL103.DWG

FINAL BID SUBMISSION

SENSITIVE BUT UNCLASSIFIED
Destroy By Shredding

Beyer Blinder Belle
Architects & Planners LLP
3307 M Street, NW Suite 301
Washington, DC 20007
202.333.8000

Fire Protection/Security
The Protection Engineering Group
14900 Bogle Drive, Suite 200
Chantilly,VA.20151
703.488.9990

Civil Engineering
Wiles Mensch Corporation
11860 Sunrise Valley Drive, Suite 200
Reston,VA.20191
703.391.7600

Structural Engineering
Weidlinger Associates, Inc.
1825 K Street, NW, Suite 350
Washington,DC.20006
202.649.2500

Mechanical/Electrical/Plumbing Engineer
Vanderweil Engineers, Inc.
625 N Washington Street, Suite 300
Alexandria,VA.22314
703.683.9700

Lighting Design
George Sexton Associates
2121 Wisconsin Avenue, NW, Suite 220
Washington,DC.20007
202.337.1903

Acoustics/Audio Visual/Telecom
Convergent Technologies
6501 York Road
Baltimore,MD.21212
410.532.2395

Exhibit Designers
C & G Partners LLC
116 East 16th Street, 10th Floor
New York, NY 10003
212.532.4460

Geotechnical Engineer
Geo Concepts Engineering
19955 Highland Vista Drive, Suite 170
Ashburn,VA.20147
703.726.8030

Cost Estimating
Faithful + Gould
1725 Duke Street, Suite 200
Alexandria,VA.22314
703.684.6550

Specifications
Heller & Metzger PC
11 Dupont Circle, NW, Suite 701
Washington,DC.20036
202.364.2222

Stamp

Keyplan

No	Date	Description
Issued/Revised		

Drawing Title

ENTRY PAVILION ROOF AND SITE LIGHTING PLAN

Scale	1/8"=1'-0"
Date	8 JANUARY 2013
Project No.	06134.00
Drawing No.	

EL1.03

Department of State **Sept. 20, 2017 @ 10:00 a.m.**

USDC Warranty Meeting Agenda

Meeting called by: GSA **Meeting Location:** USDC Pavilion

Attendees: **See the attached sign-in sheets**

A. Intro / Purpose: The purpose of this meeting is to establish a warranty list of items which should be corrected prior to the expiration of the USDC Pavilion One-Year Warranty Period, November 28, 2017.

B. Warranty / Delayed Completion Items at Project Completion:

The following two (2) work items remain from the final punch list dated April 17, 2017:

WORK ITEMS:	STATUS / NEXT ACTION
Metal Panel alignment at the NE duct shaft on the upper level.	Gilbane to ask the metal panel installer to inspect the installation and make corrections. Gilbane considers this issue closed. Metal panel installer cannot make 'simple' adjustments. Condition was reviewed during warranty meeting on 9/20 and issue closure was recommended by BBB, Heery, GSA, Gilbane.
Provide COBie spreadsheets related to mechanical equipment.	DOS representatives indicated that the spreadsheets are submitted and shall issue a formal acknowledgement. GBCo/Garner: Gilbane considers this issue closed.

C. Warranty Items:

The following items were identified as being under the one-year warranty period:

TYPE:	CONDITION / DEFECT:	NEXT ACTION:
ROOF	A roof leaks occurred May 17th and August 8, 2017 which resulted from drains being clogged with debris and water backing up in gutters. It was determined that the roof in performing as designed and that this is a maintenance and operation issue. There has not been a reoccurrence since the gutters were cleared.	DOS, FMS and USDC must develop short term and long term solutions for providing roof and skylight cleaning services. GBCo/Garner: Gilbane considers this issue closed. KRSM inspected roof and found probable flooding above sealed assembly.

		This roof will leak when flooded/inundated
	On a related issue, security equipment was damaged as a result of the roof leak. Removal of decorative panels must be done before the equipment can be serviced.	DOS shall make arrangements for the removal of side panels so that work can proceed. GBCo/Garner: Gilbane considers this issue closed. Gilbane demonstrated panel removal after the Warranty Meeting held on 20 September.
Lighting	Twenty-two (22) of the sixty (60) ground mounted light fixtures around the building shows evidence of moisture infiltration. Night time inspection revealed that fixtures on the north side of the building were not on at the time; one (1) fixture (near the flag pole) was not working; and one (1) fixture along the south side of the building was blinking.	Gilbane shall investigation the moisture infiltration and operation issues to determine the source of the problem and make corrections to the entire system during the warranty period. GBCo/Garner: Gilbane considers this issue closed. See attached diagram of problematic fixture tampering. Water entry appears related to incorrect removal and replacement of the light cover. The manufacturer and electrician have re-stablished cover integrity.
	Programming of the lighting system continues to be problematic for the building management. Training disc videos have not been distributed to the areas of concerns.	Gilbane shall breakdown the master training video into the individual areas of concern for distribution. GBCo/Garner: Gilbane to

		partition the training video on a searchable disk.
	The halogen interior ceiling lamps are burning out and being replaced frequently (forty lamps replaced thus far). A lift with an articulating capability is needed to reach some of the fixtures (and more once the exhibits are installed). The ballast fuse assemblies of the existing fixtures cannot be replaced independently; the entire fixture must be replaced when there is an issue.	DOS is considering acquiring a lift and is consider switching out the lamps to LED in the future. This is not a warranty issue. GBCo/Garner: Gilbane considers this issue closed.
Flooring	Two (2) of the four (4) walker duct access panel stone covers at the upper level in the vicinity of the elevator are cracked.	The architect shall determine the cause of the defects and the stone mason shall make recommendations for an alternative long term fix. GBCo/Garner: Gilbane considers this issue closed. Stone cracks appear related to overloading. A plan to avoid loading these stones may be required, or an alternate BBB detail such as replace with a stainless plate. DOS indicated that RUGO gave a replacement price for stone.
	Two (2) stones at the lower level have scratches and another stone was damaged by leaking lift oils.	Proposals shall be provided by the stone mason to make the repairs or replacement. GBCo/Garner: Gilbane considers this issue closed. RUGO should be contacted by DOS directly since no contractual relation currently exists for Gilbane to buy service.
Fire Protection	During the September 19th full building fire drill, which occurred while HVAC field observations were underway, it was noted that the devices in	Gilbane contacted their electrician who shall work with Ben Byle, DOS and Red

	the USDC did not alarm. It is also suspected that the door releases did not occur automatically but were done manually.	Hawk to identify the problem and make corrections as soon as possible. Gilbane is coordinating with JER
Electrical	During the use of the audio/visual system at both levels, issues with the installed programming, control and sound systems were reported. There is also a power outlet related to this system which is not working.	Gilbane and their A/V subcontractor (who has a one-year service contract with DOS) have been notified of these issues. All known defects must be corrected under the warranty period. Gilbane is coordinating with JER
HVAC	In response to multiple complaints regarding the operation of the system, including excessive cooling and the overworking of the fan motor, several conference calls and field assessments were performed by representatives of DOS-FMS, GSA, contractors, and the commissioning agent. The field assessments occurred on August 17th and September 19th which resulted in the discovery of discrepancies in the air distribution system and BAS control systems.	DOS's (i.e. FMS, Siemens, consultants) and contractor's forces (i.e. W.E. Bowers, Metro Test & Balance, Inc.) worked collaboratively to identify and resolve issues. Some changes were incorporated in the system operations in consultation with the design engineer. There were and shall be changes incorporated in the BAS system. Additional trending shall be taken and evaluated. Reports from contractors (see attached) and commissioning agent shall be submitted to the architect and DOS for approval. Going forward it is recommended that a record is kept of all operational changes being made to the system. GBCo/Garner: Gilbane considers this issue closed. See attachment from W.E Bowers.
BAS	Previously, the graphics related to the BAS systems was not approved as submitted.	Per Rick Meetre modifications made to the

Meeting called by: GSA **Meeting Location:** USDC Pavilion

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Controls	Representatives of DOS (Building Dynamics, EMCOR, Siemens) work collaboratively in the field to resolve issues.	graphics are acceptable. DOC FMS shall issue an acknowledgement to that effect. Gilbane considers this issue closed.
Doors / Hardware	In July leafs of a revolving entry doors broke or separated at the base (see the attached pictures).	This warranty items must be corrected under the contract. Gilbane considers this issue closed. Door leaf appears to operate normally by 'releasing' under excessive pressure, and then returning to normal operation. The photo taken shows the 'release lug' in open position, and not broken.
Exterior Envelope	It was brought to our attention in the meeting that during heavy or constant rains there is water infiltration in the mechanical room along the east wall. Inspection of this condition after the meeting reveals evidence of water ponding moisture along the wall. The contractor entered the access panel at the upper level and could not observe where the water had entered the building.	These conditions must be observed during a substantial rain event to discover the source of the defect. **This warranty item would survive the warranty period if not corrected.** Gilbane is still observing this condition. Kendall please comment
Elevator	Pursuant to the contract, a full, preventive maintenance / warranty is provided for a period one year after acceptance by the Government. The warranty period commenced 11/28/2016 and the Beneficial Occupancy Certification was issued 1/25/2017 (see the attached Specification Section 14 2400-12A).	The elevator service period corresponds with the building warranty period November 28, 2017. DOS shall make arrangements for elevator maintenance service after that date. If the provider shall be changed, some overlap in coverage would be beneficial to properly close-out the existing service contract. Gilbane considers this issue closed.

Security	As previously indicated, the security equipment was damaged as a result of the roof leak. Removal of decorative panels must be done before the equipment can be serviced.	Some consideration was suggested to place a top or protective cover over such equipment to prevent a re-occurrence. Gilbane considers this issue closed. Requests for alteration should be made directly with the manufacturer.

D. Close-out Issues:

The following close-out issues and requirements must be completed:

WORK ITEMS:	STATUS / NEXT ACTION
Mechanical Access Platform	This change work item has been deleted from the general contractor and funds are withheld. A vendor (Morningstar) has submitted a proposal after reviewing the scope on-site with EMCOR. The proposal and sketch were submitted to DOS for approval. Representatives of EMCOR indicated in the meeting that in addition to the scope of work reflected in the proposal, plywood sheathing should be placed over suspended ductwork where access is needed. The strategy to proceed involves issuing a procurement to EMCOR, who is listed on the GSA Schedule, to install the platform. There are several hurdles to accomplishing this but the first task is for DOS and EMCOR to finalize a complete scope of work and IGE within the available funds withheld from the contractor. Gilbane considers this issue closed.
Close-out Submittals	Heery International, Inc. must submit the final warranties to DOS for their records. The submission shall be in hard and electronic copies and include a summary of extended warranties and contact information. Gilbane considers this issue closed.
	Gilbane Building Company shall breakdown the master training video into the individual areas of concern for submit for distribution. Gilbane will provide.
LEED	Beyer Blinder Belle architects must indicate if additional information is needed prior to making the final submission for certification. CxGBS has expertise in this area and is offering to assist if needed. Gilbane considers this issue closed.
CPARS	The general contractor and construction manager shall determine the status of the CPARS submission and review.

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	Gilbane considers this issue closed.
Loss EarthCam Camera	The EarthCam camera mounted at the Federal Reserve Building during the course of the construction is missing. This camera is the property of GSA. This matter was not discussed at this meeting. Gilbane considers this issue closed.

Diplomacy Center

Date: 12/7/2017

Purpose: Warranty Comment Responses
From: Michael Garner / Gilbane

The following comments are in response to GSA/Diplomacy observations from J. Bailey dated November 22, 2017. (The issues are restated below, with Gilbane and sub-contractor comments following.)

Gilbane does not consider Items #1, 2, 3 Warranted failures. Item #4 is to be corrected by Siemens.

1. The supply airflow as measured by the air flow monitoring station for AHU-1 is usually 4,000 to 6,000 cfm higher than the summation of the VAV boxes and is outside the normally accepted range of +/- 10%. We reviewed the flow coefficients in the Siemens programming and compared them with the flow coefficients in the TAB report and found that seven of the coefficients in the programming are different than the coefficients on the TAB report. This could account for some of the discrepancy. FMS does not know why they are different. FMS would not have any reason to change the coefficients in the programming. The contractor should review the TAB report Box coefficients and the programmed coefficients and let us know, which are the correct coefficients. The discrepancy in airflow between the summation of the VAV boxes and the airflow monitoring station of AHU-1 is a defect and not due to operation of the system by FMS.

Gilbane Comment: Gilbane considers this issue to be closed, as there is no identifiable sub-standard component or installation.
The balanced condition baseline was successfully established by Gilbane according to contract, demonstrating normal operation of the pavilion conditioning system. Subsequent modification of the system and deviation from the baseline falls under the responsibility of the facility managers.
The following comments from our sub-contractors may be helpful.

Siemens Comment: After the balancing report was submitted and approved, the commissioning commenced. As per the commissioning agent's direction, some of the VAVs and their settings were modified based on readings taken during commissioning. It was the commissioning agent's direction to modify these values. I am not 100% sure, nor can I fully say that this is the cause of these issues. If requested, please send Siemens the TAB reports and we will replace the readings as suggested. We cannot however recalibrate or reset the VAV's as we are not outfitted with that capability. We will also not support another balancing endeavor without being paid.

Metro Test and Balance Comment: We are aware that commissioning and other activities "post-TAB" modified settings placed in the system during TAB. This was also noted during the recent recheck associated with the supply fan operations which turned out to be a return fan tracking issue. As to the airflow stations – summarizing VAV boxes and then using that to compare bulk airflow station readings is not representative of how the systems were tested and flow stations calibrated, especially with the current knowledge that the coefficients have been changed – again – the VAV indicated airflow value are in question. VAV testing and calibration occurred at full flow values as the calibration is a single point evolution – we have no data to show matched values at any other points of operation but the coefficients have been changed so this probably represents some of the error observed. Once the VAV maximum airflow is calibrated during TAB the flow ring reading is "trusted", this is a standard practice for this commercial building type installation. Bulk airflow stations were calibrated to the best of the installed conditions. Note many aspects of the system were installed as they "could fit" instead of normally

recognized and verifiable conditions where total air summaries via single duct traverses could be performed. AFMS readings were coil velocity verified, not duct traverse verified due to lack of traverse locations.

Metro Test and Balance Comment: Also note we confirmed/re-inserted all the VAV coefficients just recently while on site investigating the supply fan concern. This correspondence confirms since TAB CX and operating activities within the facility the coefficients have been changed numerous times. This calibration point is not something that should be changed by operators, and it is not a warranty issue to correct what has been altered by others.

Metro Test and Balance Comment: We are aware that no TAB occurred in the restrooms following modifications due to failed transfer airflow performance, (see MTB-RFI#1). In the name of cost control (as we were told) we were denied a change to return and verify exhaust flowrates and VVE controlling static resulting from the restrooms modifications made to improve the air changes and negative profile in the restrooms. TAB verification was eliminated in favor of a negative "feel" test, i.e. result only. VVE-1.1 serves this area and may or may not have an inlet static net effect as a result of improving transfer airflow into the restroom, this VVE is the limiting exhaust valve in determining the controlling static set point (see MTB-RFI#2).

WE Bowers Comment: Bowers has reviewed our Subcontractors responses above and we concur with same.

2. The damper that is creating noise (VVDE 1-3) in the northwest corner of the upper level is an exhaust damper. This damper is not shown on the graphics for the Siemens system and is not shown the bid drawings provided to FMS. Therefore, it must have been added after the bid drawings were completed and there are probably RFIs generated during the project that resulted in installation of this control damper. VVDE 1-3 is shown on the TAB report and the TAB drawings. Changes to operation of this modulating damper have not been made by anyone at FMS or EMCOR because we were not even aware of the damper until investigating the noise issue and it is extremely difficult to find the damper in the controls system unless you drill down into the controls hierarchy and change the programming. Security guards at the front entrance indicated that they have heard the annoying noise for a very long time. I inspected the damper today and observed the following:

Gilbane Comment: Gilbane considers this issue to be closed, as there is no identifiable sub-standard component or installation.
Installation of VVDE 1-3 has been performed according to plans and specs.
Gilbane submitted RFI 0602 on 11/22/2016 alerting the team with detailed observations of system noise at VVDE 1-3, to which no action was directed.
Comments following offer additional clarification.

Siemens Comment: If the damper is not on the graphics, Siemens will ensure this gets added. The damper can be easily found in "System Profile" if it is not on the graphics. NO PROGRAMMING MODIFICATION is required to access this damper. Please note that the EMCOR personnel are trained on how to view a VAV without modifying programming. It seems that EMCOR (mainly those charged with the operation of the system and who attended the training) are not being consulted. A qualified person who actually attended training should be operating the system for fear of mistakes leading to emails such as the previous ones received.

Siemens Comment: The damper was initially a part of the project and is noted on contract documents in multiple areas. This noise has also been addressed by the contracting and commissioning tier. The proper

damper was provided according to the specs. Bowers provided suggestions to the tier about correction of the noise but their suggestions were dismissed.

Metro Test and Balance Comment: We recognized and participated in discussions regarding noise and control of this damper during TAB. Refer to attached MTB-RFI#2_Subject: VVDE-1.3 Noise concerns/CFM set point clarification. This is not a new issue, nor is it a TAB issue; it is a result of controlling static necessary to make VVE-1.1 work. VVE-1.1 has an extremely long duct run and serves areas in addition to the restrooms. Design, installation, and control modifications were potentially needed but likely due to cost control measures were not pursued by construction management. It is not a warranty issue; TAB was signed off on with the functional performance testing by the government and CXA.

WE Bowers Comment: The VVDE 1.3 Damper are included as part of the Base Contract Scope of Work. See Drawings M6.01, Variable Air Volume Damper Schedule that provides the design criteria for subject damper. See Contract Drawings M1.02 and M3.02 Detail 5 for the location of subject damper. See Drawing M4.01 for a schematic of the system that includes typical Exhaust VAV, See Drawing M7.02 Note 5 for Mechanical Control Sequences associated with the Energy Recovery Unit and the Ventilation System. This equipment was not added to the contract as suggested above.

WE Bowers Comment: WEB submitted Bowers RFI-082 on 11-22-2016 (Metro Test & Balance RFI-2) VVDE 1.3 Noise Concerns. We sent several follow-ups and did not receive a reply to the RFI that was submitted. On 12-20-2016 we sent another follow-up asking about an answer to the noise concerns. On 12-21-2016 Gilbane responded to my email and confirmed that based on meetings with the Owner the Noise Issues would be considered closed when the smoke tests are passed. On 12-22-2016 we received an email from Gilbane advising that the Smoke Test Passed "All is Good". We considered this email a closure to the Noise Issues.

WE Bowers Comment: Based upon the email trails that Bowers received we believed that the Owner had accepted this work last December.

a. The noise was very evident and inspection of the damper found that it was almost fully closed (slightly open). The damper was manually opened and the noise disappeared indicating that the noise is emanating from the damper and not grilles near the ceiling. The noise is excessive and will impact any speaking events when they occur.

Siemens Comment: This is a known and previously investigated issue.

Metro Test and Balance Comment: Agree, this is not a new issue. The box has a wide range of airflow set points from 6300CFM to 0CFM so it is not surprising to find it throttled down for minimum airflow, it is sized for maximum airflow. It was noted and discussed but not pursued by the construction management team, refer to MTB-RFI#2_Subject: VVDE-1.3 Noise concerns/CFM set point clarification resulting from the controlling static needed for VVE-1.1. This is not a warranty issue.

WE Bowers Comment: This is not a new issue and or a warranty issue.

b. The damper is not shown on the graphics. Contractor should modify the graphics to show this control box similar to VVDE 1-1 and VVDE 1-2, which are shown on the graphics.

Siemens Comment: The graphic for VVDE-1.3 can be easily accessed through system profile. Siemens will however add this to the graphic.

WE Bowers Comment: We will defer this issue to Siemens for updating graphics if required.

c. The Asbuilt control drawings (Sheet 005D, E, and F) show that the box is controlled by a thermostat and CO2 sensor. It is not obvious to us why a thermostat is controlling an exhaust damper since exhaust would be expected to be proportional to outside airflow. However, with the cold weather of November VAV boxes are in heating and the box control dampers are at minimum position. If VVDE 1-3 is controlled by the thermostat, then VVDE 1-3 would also be at minimum position as well. During warmer weather (summer months) when the supply boxes were cooling and above minimum damper position, VVDE 1-3 was also probably above its minimum damper position. The noise appears to be the loudest when the damper for VVDE 1-3 is at minimum, which would coincide with recent heating conditions. So the noise occurs when the system is doing what it is apparently supposed to do under normal control. Therefore, the noise generated by the system is a defect and not normally expected from an HVAC system. The contractor should resolve the noise issue under the warranty.

Siemens Comment: The box has a thermostat attached due to the nature of the wiring control through the building. It was a termination point for the NW temperature sensor but that does not mean it controls the damper itself. There is complex code controlling the exhaust system and VVDE-1.3. Please read the contract sequence of operation for more information and a better understanding of the operation of VVDE 1-3.

WE Bowers Comment: We agree with the statements listed above "the noise occurs when the system is doing what is apparently supposed to do under normal control". However this is not due to defective workmanship, equipment and or by the ATC System work furnished by the contractor's it is related to the Design and Operation of the System.

WE Bowers Comment: The noise occurs when the exhaust damper starts to open against approximately 2.8 inches of negative static. The sudden air flow across the damper blades is creating the noise that has been reported. One option to possibly mitigate the noise being created would be to change the equipment sequence and provide a minimum exhaust air flow thru VVDE 1.3. This of course would create other issues that would have to be addressed such as exhaust air flows thru the other exhaust boxes and also corresponding changes to increase the amount of outside air required to maintain static pressure. These changes are outside of Bowers and its Subcontractor's scope of work.

3. While Siemens was at HST last week performing their normal weekly maintenance, we looked at the thermostat and VAV boxes that control the upper level of the northwest corner of the US Diplomacy Center because these boxes have always been cooling while the space temperature was 71 deg F by opening control dampers above minimum position. The sequence of operation of the asbuilt control drawings indicate that the VAV box will maintain minimum airflow with no reheating when the space temperature is between 70 deg F and 75 deg F. Once the space temperature rises above 75 deg F then dampers will open to increase airflow to maintain 75 deg F. When Siemens looked at the Graphics, it was pointed out that there is a sliding scale indicator where the space setpoint can be adjusted through the graphics. But using this sliding scale indicator did not allow a deadband. Therefore, when the setpoint was 70 deg F, the box damper remained at minimum and started to reheat when temperature went below 70 deg F. When the space temperature went above 70 deg F, the reheat valve would close and VAV box damper would begin to open to maintain 70 deg F. So use of the sliding scale indicator did not allow a deadband and would control to 70 deg F for both heating and cooling. FMS or EMCOR did not install or request this control sequence, which controls to single a temperature. This is why the space was always around 70 deg F, which is too cold. In accordance with our request Siemens removed the sliding scale indicator and replaced it with a heating setpoint box (75 deg F) and a cooling setpoint box (70 deg F) on the graphics and changed the

programming. Since then the space temperature has been observed at around 73 deg F with the damper in minimum position and no reheat, which is what is expected from the sequence of operation. It appears that Siemens did the same thing for the other three thermostats and VAV boxes controlling the upper level of the diplomacy center. However, on the VAV boxes on the lower level the graphics are not shown the same as the boxes for the upper level. Some of the graphics still show the sliding scale indicator and others do not show a cooling setpoint box and heating setpoint box. We want all the boxes to operate per the original sequence of operation, but with the ability to change the setpoint if needed, and have all the graphics look the same for each box. The contractor should verify that all the lower level boxes are operating to the contract documents with a deadband between 70 deg F and 75 deg F instead of a single temperature. If not, the contractor should have the sequence corrected. FMS did not request setting VAV box control to a single setpoint and did not make any changes to the control system to accomplish this. It is not known why the system was turned over to FMS with this operational sequence, which does not conform to the contract documents or the asbuilt control drawings. We consider this a defect and not due FMS operation of the system.

Gilbane Comment: Gilbane considers this issue to be closed, as there is no identifiable sub-standard component or installation.
Please consider the sub-contractor comments below. Siemens indicates that systems can be managed as requested, upon request.

Siemens Comment: Siemens will reiterate that this was a commissioned system and FMS, DOS, EMCOR all had time in which to voice their concerns or opinions during the commissioning process and training. There seems to be a lack of understanding how the Siemens VAVs operate which is causing these requests and errors. Siemens can alter the system based on requests from EMCOR during our schedule Preventative Maintenance contract at the direction of EMCOR; however this is not a warranty issue. This is shifting the fundamental conventions as commonly adopted on the DOS system.

Siemens Comment: A single point of control was provided for multiple VAVs because a single thermostat was provided due to redesigns during RFI processes. The graphics are not the same for the basement VAVs because the control sequence is not the same. There seems to be a misunderstanding this knowledge. As for single point setpoint control, changing CTL STPT directly does not create a lack of deadband. There are many factors that contribute to ensuring a proper deadband of a setpoint to prevent noisy control. The main setpoint is SWITCH DBAND which limits the switch between heating and cooling ensure that CTL TEMP vs CTL STPT is greater than this difference before switching.

WE Bowers Comment: Bowers has reviewed our Subcontractors responses above and we concur with same.

4. Siemens also found that the temperature sensor for Box VVD-2 was located upstream of the coil. It should be installed downstream of the coil. This should be corrected by the contractor.

Gilbane Comment: Siemens will resolve the sensor location.

Siemens Comment: If this is the case, we apologize both for this error and second for the lack of catching this during our commissioning process. We will work to get this resolved as soon as we can get an electrician cleared to alter the location.

WE Bowers Comment: We will defer this issue to Siemens for resolving this issue.